Oxix®

Dissolved Oxygen Transmitter

Installation and User Manual

FW: 841013-009, 846001-002, 841513-009

CE CERTIFICATE OF CONFORMITY

This product complies with the requirements concerning electromagnetic compatibility (EMC) stipulated in Council directive no. 89/336/EEC of 3rd may 1989, alteret at directive no. 92/31/EEC, on the approximation of the laws of the member states relating to electromagnetic compatibility.

CE approvals

We declare that the Oxix® transmitter complies with the values stipulated in EN-61010-1 and EN 61326-1.

Ex approval

The Oxix® transmitter is approved for mounting in explosive amospheres: Ex II G3.

Table of Contents

1. Introduction 7
About this Manual 8
Operating Principles 10
Features 11

2. Safety, Repair and Product Identification 13
Safety Instructions 13
Physical Mounting 13
Repair 13
Product Identification 13

3. Specifications and Order Numbers 15
Specifications 15
Order Numbers 17

4. Sensor Installation 19
Physical Sensor Installation 20
Preparation 20
Positioning the Sensor 20

5. Sensor Calibration 21
Zero-point Calibration Check 21
2-point Calibration 21

6. Converter 23
Electrical Mounting 23
Power Supply 24
Display Connector 24
Changing the Power Supply Voltage 230/115 V AC 25
Analogue Output 27
Digital Input 28
Converter Terminals 29
Sensor and Mounting Kit / Connection Board Terminals 30

7. System Configuration Examples 31
Magflux® with Blind Lid and Oxix® with Display Unit 32
Wiring Schematic #1 33
SuSix® with Blind Lid, Magflux® with Blind Lid and a Remote Display 34
Wiring Schematic #2 35

8. Startup 37
Initial Checks before Power-up . . . 37
Initial Power-up . . . 37
Initial Measurement . . . 37
Language Selection . . . 37
Display Read-out, one connected unit . . . 38
Display Read-out, several connected units . . . 39
Display Keys . . . 39

9. Oxix® Menus 41
Converter Overview Menu . . . 41
Specify Main Screen . . . 42
Datalogger . . . 44
Graph Display . . . 46
Password . . . 47
Sensor Name . . . 49
Converter Setup . . . 51
Averaging . . . 52
Units . . . 52
mA Output . . . 53
Cleaning . . . 54
High alarm . . . 56
Low alarm . . . 57
Sensor error . . . 58
Status . . . 59
Factory settings . . . 60
Service Menu - Digest . . . 61
Service Menu - Detailed . . . 62
Display Setup . . . 72
Language . . . 73
Set clock . . . 74
Modbus . . . 75
Factory settings . . . 77
Display SW version . . . 77

10. Mechanical Dimensions 79
Sensor . . . 79
Converter and Display Unit . . . 80
Immersion Fitting . . . 81

11. Maintenance 83
Cleaning the sensor . . . 83
Cleaning the converter display . . . 83
Functional Tests . . . 83
Service Contract . . . 83

Appendix A. Pop-up and Error Messages 85

Appendix B. MJK-Field Link Software 89
Important Notes! 89
A. Connect a PC to the Oxix® 89
B. Save Log Data 91
C. Upgrade Display Firmware 91
D. Upgrade Converter Firmware 93
E. Install/Add Languages 94

Appendix C. Front Panel Cut-out Drawing 95

Appendix D. Log Files 97

Appendix E. Input/Output Connections 101

Main Menu Overview 102

Converter Setup Menu Overview 106

Service Menu Overview 114

Display Setup Menu Overview 120

Index Index-1

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1. Introduction

Thank you for choosing the MJK Oxix® Dissolved Oxygen Transmitter. We have done our utmost to design and manufacture a quality transmitter that satisfies your requirements:

- **High performance optical sensor**
- **No calibration**
- **No spareparts needed in sensor's 10 year lifetime**
- **Air or water jet cleaning system is standard**
- **Measurements not affected by sunlight or dry environment**
- **Large, easy-to-read display with trend curve capability**
- **Multiple languages**
- **Built-in datalogger**
- **No moving parts, oxygen consumption or risk of poisoning**
- **Mounting accessories** (optional)

The Oxix® transmitter is easy to install, calibrate and put into service. However, read this manual first to get familiar with the Oxix® transmitter and all its features.

The equipment must be handled and operated as instructed by the manufacturer, MJK Automation A/S to ensure stable operation and accurate measurements.

You can always contact your local representative or the MJK hot lines for advice and guidance:

- **Europe** Tel.: +45 45 56 06 56 E-mail: mjk@mjk.com
- **Denmark** Tel.: +45 45 56 06 56 E-mail: mjk@mjk.dk
- **Norway** Tel.: +47 69 20 60 70 E-mail: mjk@mjk.no
- **Sweden** Tel.: +46 53 31 77 50 E-mail: kontoret@mjk.se
- **Holland** Tel.: +31 251 672171 E-mail: mjknl@mjk.com
- **USA** Tel.: +1 847 482 8655 E-mail: mjkusa@mjk.com
- **Australia** Tel.: +61 3 9758 8533 E-mail: ns@mjk.com

Visit our web sites at www.oxix.dk and www.mjk.com to learn more about MJK Automation, our other products and the people behind them.

Oxix® is a registered trademark of MJK Automation A/S, Denmark.

About this Manual

This manual is divided into one table of contents, eleven chapters, five appendices, four continuous menu overview flow charts and one index.

1. Introduction

Contains a presentation of the Oxix® Dissolved Oxygen Transmitter, the structure of this manual, the operating principles and the top features.

2. Safety, Repair and Product Identification

Provide answers to issues regarding safety, mounting, repair, restrictions and product identification.

3. Specifications and Order Numbers

The system specs and order numbers are listed for quick access.

4. Transmitter Installation

Contains installation guidelines for positioning of the transmitter in liquids, distances to walls and other solid faces, and installation in tubes.

5. Sensor Calibration

The Oxix® sensor is factory calibrated and requires no re-calibration.

6. Converter

Describes the physical specifications and installation rules for the converter such as power supply, in- and outputs, sensor/converter/ display configurations, etc.

7. System Configuration Examples

Illustrate how Oxix® Dissolved Oxygen Transmitter can be interconnected with for example MJK MagFlux® flow meters in real-life scenarios.

8. Startup

Describes important checks and basic settings to get started including the display and keyboard user interface.

9. Oxix® Menus

Contains a comprehensive description of the Oxix® menus, options and utilities.

10. Mechanical Dimensions

Lists the Oxix® Dissolved Oxygen Transmitter dimensions.

11. Maintenance

Contains procedures for cleaning the sensor and the display.

Appendix A. Pop-up Events / Error Messages

Lists possible pop-up messages, explains their meaning and offer solutions to error conditions.

Appendix B. MJK-Field Link Software Upgrade

Describes in detail how to utilise the unique and intuitive MJK-Field Link software program to upload new display and converter firmware versions.

Appendix C. Front Panel Cut-out Drawing

A 1:1 scale drawing of the front panel outline and cut-out area for installation and mounting purposes.

Appendix D. Log Files

An example log file illustrates the format and explains the entries.

Appendix E. Digital Input/Output Connections

Illustrates how the digital in- and outputs can be interconnected.

* * * * *

Main Menu Overview

A continuous presentation of the top level menu structure.

Converter Setup Menu Overview

A continuous presentation of the converter setup menu structure.

Service Menu Overview

A continuous presentation of the service menu structure.

Display Setup Menu Overview

A continuous presentation of the display configuration menu structure.

Operating Principles

The MJK Oxix® Dissolved Oxygen Transmitter is designed for measuring the oxygen contents in open tanks exposed to sunlight, wells and closed containers.

The Oxix® sensor function is based on the fluorescence principle and does not consume oxygen like membrane-type sensors. It is rugged and designed to handle tough applications.

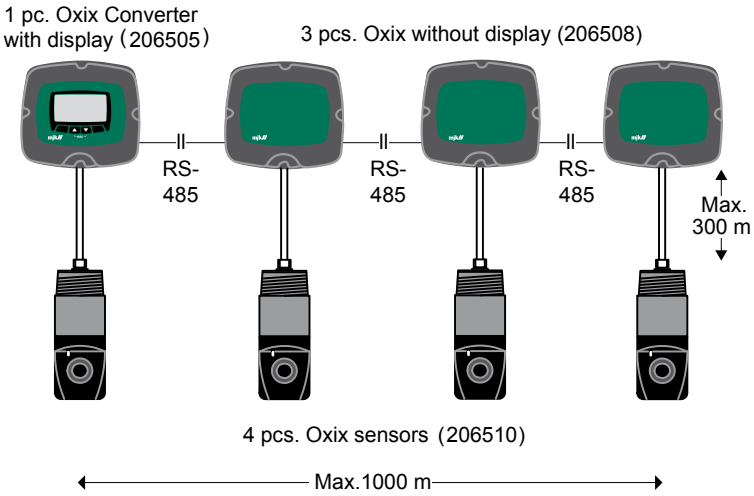
Light pulses with a wavelength of 475 nm are transmitted to a ruthenium compound immobilized in a sol-gel matrix.
The ruthenium absorbs the light energy by changing the outer electron's energy level. The unstable electron then collapses and returns back to its original energy state and at the same time emits the surplus energy as a photon with a wavelength of 600 nm. This process is also refered to as fluorescing.

When the intensity of the transmitted light pulses is tightly controlled, the amount of fluorescing is predictable and repeatable.
If free oxygen molecules are present, the photon energy is absorbed by the oxygen molecules without any light emission, and the amount of fluorescing is consequently reduced (also refered to as fluorescence quenching).
It is therefore possible to determine the amount of dissolved oxygen by measuring the amount of fluorescence quenching (light intensity).

Features

Flexible Installation

MJK's modular design allows up to 300 meters (950ft.) between the sensor and the converter, and the Display Unit can be mounted up to 1000 m (3000 ft.) from the signal converter with ordinary twisted wires.



One Display Unit can control up to four MagFlux® flow meters, SuSix® transmitters and/or Oxix® transmitters for greater economy, space savings and an improved overview of the multiple measurement values.

Simple to Operate

The Oxix® Display Unit has a mobile phone-like menu structure and can display text in several selectable languages.

PC Connection

Oxix® allows downloading setup configurations, uploading new instrument software updates and display customization. The onboard data logger captures 20.000 readings which are displayed as an electronic graph and can be retrieved as a CSV file on a PC. This connectivity is achieved with a common USB port and the free MJK Field Link software.

Flexible In- and Outputs

The Oxix® Transmitter has one 4-20 mA analogue output, two digital outputs for alarms or control, and one digital input for resetting alarms, batches, etc.

User-definable Text

Up to five lines of text and readings can be configured by the user. The graphic display is automatically adjusted to show the largest characters possible. Alarms can be displayed as pop-up alarms until they are reset.

Modbus® Communication

The Display Unit uses the Modbus® RTU communication protocol to connect to the Oxix® Transmitter. The Transmitter can in turn connect to SCADA systems with its Modbus® communication protocol.

2. Safety, Repair and Product Identification

Safety Instructions

- Read this manual carefully.
- Pay attention to the environment on the installation site.
- Wear necessary protective equipment and follow all current safety regulations.
- Oxix® can invoke a start signal for dangerous machinery. Always ensure that connected machinery and other equipment are effectively put out of service (that is to remove the main fuses and lock main and security switches in off-position) before commencing configuration, fault finding, servicing, maintenance work, etc.
- **WARNING**: There is a risk of lethal, electrical shock from the "Mains supply" terminals "N" and "L". Be careful not to touch these terminals when the Oxix® front cover is removed.
- **WARNING:** Incorrect installation or use can lead to body injury and/or material damage!

Physical Mounting

The Oxix® converter/display unit ***must not*** be mounted in explosion hazardous areas!

Oxix® may only be installed and commissioned by authorized MJK personnel, and all national and local regulations must be complied with.

Repair

Repair must only be made by authorized MJK personnel or by a service representative approved by MJK.

Product Identification

A delivery will usually consist of an Oxix® sensor and an Oxix® converter with or without a display unit.

Check that the item(s) delivered corresponds to the ordered item(s). The part number is printed on an identification label stuck on the converter shipping box and on a label on the converter itself.

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3. Specifications and Order Numbers

Specifications

Oxix® Transmitter	
Accuracy	+/- 0,1% of reading
Measuring input	RS 485
Analog output	One active 4 - 20 mA, galvanically isolated (max. load 800 Ω)
Digital outputs	One voltage-free electromechanical relay (max. 50 V DC / 1 A) One optically isolated MOSFET relay (max. 50 VAC / V DC / 120 mA)
Digital inputs	One, max. 30 V DC, < 5 V DC = 0(low), > 10 V DC = 1(high), pulse length > 100 ms
Communication	MODBUS® RTU-mode, 9600 baud, 2-wire RS 485, slave-mode
Interface	RS 485 for connection to Display Unit or PLC
Power supply	10 - 30 V DC, or 24 V AC, 50 / 60 Hz ± 10 % or 115 V AC, 50 / 60 Hz ± 10 % or 230 V AC, 50 / 60 Hz ± 10 %
Power consumption	Max. 10 W
Cabinet material	Polycarbonate, glass reinforced
Enclosure rating	IP 67, NEMA 6
Temperature range	- 20 … 60 °C
Weight	1,1 kg

Display Unit	
Enclosure rating	Dust and waterproof IP 67, NEMA 6 (when mounted on converter)
Housing material	Polycarbonate, glass reinforced
Protection lid	Transparent polycarbonate
Display	White backlit LCD-display (64 x 128 pixels) with softkeys
Indication	Indication measurement, configuration and graph
Clock	Real-time clock with built-in battery backup
Communication	MODBUS® RTU-mode, 9600 baud, 2-wire RS 485, master-mode
Interface	RS 485
Memory	256 Kb Flash memory, 20.000 entries with date, time and value
Interface	USB 1,1 type mini B, Female
Temperature range	- 20 … 60 °C

Oxix® Sensor	
Dissolved oxygen saturated	0 - 30.0 mg/l or ppm (parts per million) 0 - 120 %
Measurement principle	Optical, near infra-red fluorescence (I_{in} = 475 nm, I_{out} = 600 nm)
Sensor check	Automatic self-diagnostics
Pressure	6 bar (100 psi)
Materials	Boby and Head: PU, PVC, silicone, epoxy and stainless steel 316 SS Optical lens: Sapphire O-ring: Viton Cable: PUR
Cleaning system	Built-in air or water jet
Cable	4 x 0,326 mm^2, shielded, outer diameter Ø 5.0 mm (22 AWG)
Cable length	10 m (33 ft.), can be extended up to 600 mm
Response time	t_{90} less than 1 second, t_{95} less than 60 second
Flow velocity	No flow required
Power supply	12 V DC (10 -16 V DC), approx. 10 mA
Output	RS 485, 9600 baud, 2-wire
Accuracy	Better than 1% of actual reading (0,02 mg/l)
Resolution	Better than 0,02 mg/l
Temperature range	0 - 60 ºC
Temperature compensation	0 - 50 ºC
Enclosure rating	IP 68 to IEC 529 (10 m), NEMA 6
Dimensions	50 x 130 mm (diameter x length)
Mounting	1,5 inch NPT thread 0,25 inch NPT thread for jet spray cleaning tube
Weight	0,77 kg (1.7 lbs)

Order Numbers

Oxix® Converters	
206304	*Oxix*® Converter w/ display, 10 - 30 V DC
206305	*Oxix*® Converter w/ display, 230 / 115 V AC
206306	*Oxix*® Converter w/ display, 24 V AC
206307	*Oxix*® Converter without display, 10 - 30 V DC
206308	*Oxix*® Converter without display, 230 / 115 V AC
206309	*Oxix*® Converter without display, 24 V AC

Oxix® Sensor	
206510	*Oxix*® Sensor

Accessories for *Oxix*® Sensors	
155230	*Oxix*® Insertion adapter, 1½" NPT inner thread -> 2" RG outer thread
155236	*Oxix*® Immersion fitting
691120	Cable for *Oxix*® sensor (PUR)
-	1½" NPT to 1¼" RG Adapter

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4. Sensor Installation

WARNING!

The Oxix® transmitter must not be powered until the transmitter is correctly mounted and connected!

WARNING!

Connections to the Oxix® transmitter must not be disconnected while the transmitter is powered.

Important!

To ensure safe and optimal functionality of the Oxix® transmitter, the instructions below must be followed closely.

- The sensor must be mounted in a location where it is possible to perform a representative dissolved oxygen sat. measurement.
- Fittings and mountings must be capable of carrying the sensor's weight (0,77 kg / 1.7 lbs), and vibrations from for example pumps and other equipment must be avoided.
- The system should be installed to facilitate access to the Oxix® transmitter operator panel and sensor without risking personal injury during normal operation, maintenance, cleaning of sensor, etc.
- The Oxix® transmitter must be connected to a mains outlet that complies with national and local regulations.
- All cables must be installed, connected and mounted to minimize mechanical impact and electrical influence from other installations.
- The sensor cable's maximum tensile load is adjusted to the sensor weight.
- The sensor is a electro-mechanical instrument. Be careful not to damage the sensor lens. The accuracy will deteriorate if foreign material accumulates on it, or it is subject to abrasive cleaning procedures. Only use a soft cloth for cleaning. NEVER EVER a steel brush!
- All fuses are located on the Oxix® converter's motherboard.

Physical Sensor Installation

Preparation

Select a position that can produce a valid and representative measuring value and provide sufficient space for physical cleaning of the sensor on a regular basis.

Positioning the Sensor

The positioning of the sensor is very application dependant. There are, however, some "do"s and "don't"s that can be used as guidelines.

Do

- In aeration tanks or basins with significant fluctuation in depth the sensor should be mounted on a foating device that keeps the sensor submerged to a fixed depth from the surface.
- In tanks or basins with no or little fluctuation in depth the sensor may be mounted in a fixed position approximately 1/4 below the surface.
- The optimal position at installations in flow-through aeration basins with one measuring point is near the tank inlet.
- The optimal positions at installations in flow-through aeration basins with two measuring points are near the tank inlet and the tank outlet.

Don't

- Do not position the sensor at or very close to the surface. Strong wind aeration leads to increased dissolved oxygen concentration in the surface layer which may not be representative.
- Do not use a fixed sensor position in aeration tanks/basins with significant depth fluctuations. The dissolved oxygen saturation varies with the depth.

5. Sensor Calibration

The Oxix® sensor is factory calibrated. No further calibration is required.

Zero-point Calibration Check

A zero-point calibration check may be carried out as described below.

Required materials

- 1 bucket
- 1 measuring cup
- 1 tablespoon
- Sodium sulfite (Na_2SO_3)

Procedure

1. Dissolve 3 tablespoons of sodium sulfite (Na_2SO_3) in a bucket (or open container) containing 4 liters of clean tap water (1 US gallon, 0.9 UK gallon).
2. Stir for about 1 minute.
3. Lower the sensor into the solution and let it rest at least half an hour.
4. Make sure that the sensor's measuring element is facing down, and no air bubbles stick to the lense.
5. Check that the the Oxix® readout is zero.

2-point Calibration

2-point calibration is normally not required and is not recommended.

For very special applications it is possible to perform a 2-point calibration of the Oxix® transmitter. If required, contact an MJK sales or service representative for further details.

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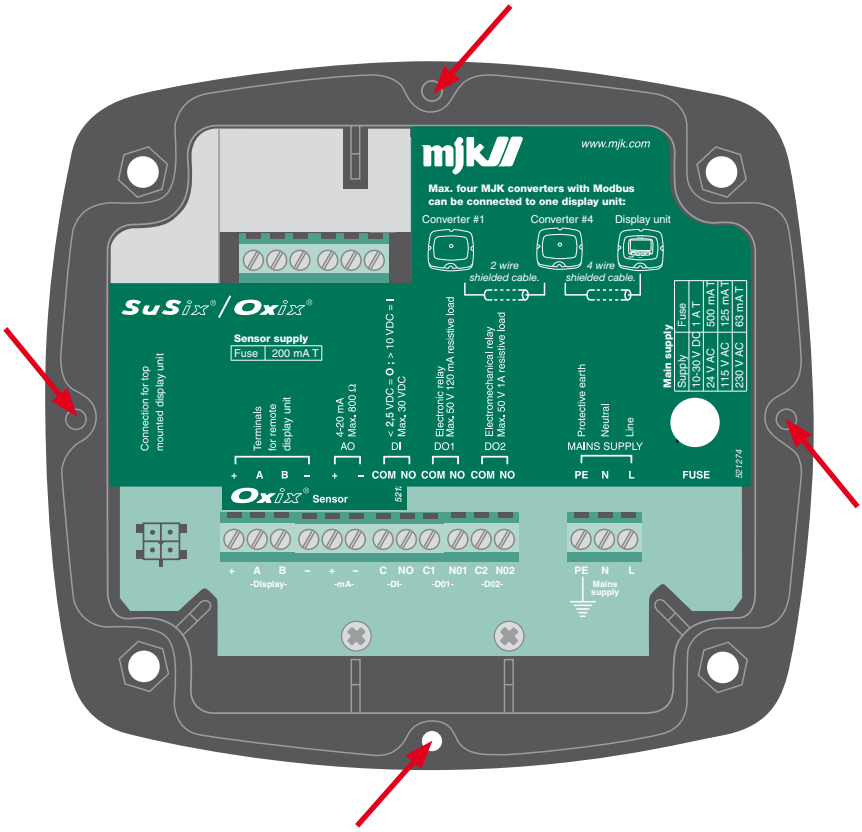
6. Converter

Electrical Mounting

Warning!

The Oxix® converter/display unit must not be mounted in explosion hazardous areas!

Loosen the four screws (positions indicated by arrows) and remove the display unit to gain access to the terminals.



Power Supply

The flow converter must be supplied from a properly fused mains outlet, a 24 volt AC outlet, or a 10 - 30 V DC power supply/battery.

Power Supply 230 V AC, 115 V AC or 24 V AC	
Terminal	**Designation**
PE	Protective ground
N	230 / 115 / 24 V AC neutral
L	230 / 115 / 24 V AC live

Power Supply 10 - 30 V DC	
Terminal	**Designation**
PE	Protective ground
—	DC neutral
+	DC live

The internal fuse ratings are:

Internal Fuse Ratings			
Voltage	**Rating**	**Order no.**	**Dimension**
230 V AC	0.063 mA T	550030	5 x 20 mm
115 V AC	0.125 mA T	550035	5 x 20 mm
24 V AC	0.5 mAT	550049	5 x 20 mm
10 - 30 V DC	1.0 AT	550051	5 x 20 mm

The technical specifications for a 10 - 30 V DC power supply/battery are:

Technical Specifications for 10 - 30 V DC Power Supply	
Power consumption without display	< 5 W
Power consumption with display	< 8 W
Peak start current @12 V DC,1 second	Approx. 1,5 A
Peak start current @24 V DC,1 second	Approx. 1 A

Display Connector

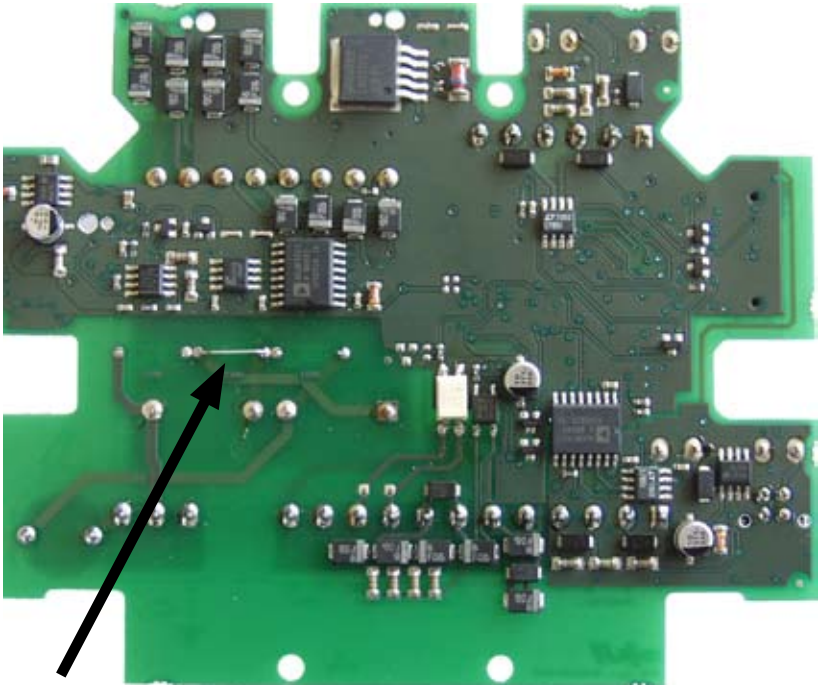
The display wires (and the remote display extension cable) are colour coded as follows:

Display Connector	
Wire colour	**Designation**
Red	+ supply
White	RS-485 A
Grey	RS-485 B
Black	- supply

Changing the Power Supply Voltage 230/115 V AC

To change the input mains voltage from 230 V AC to 115 V AC (or vice versa) proceed as follows:

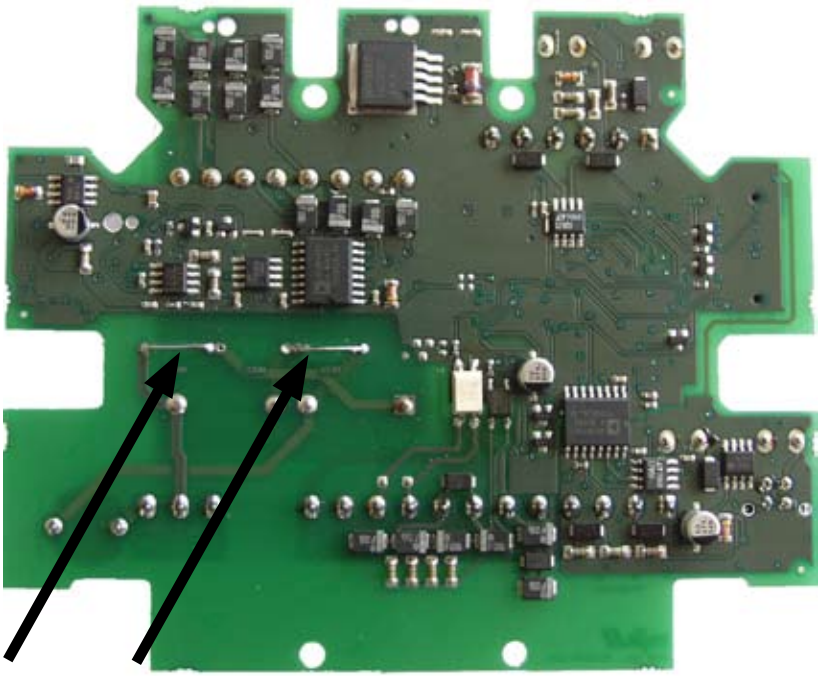
1. Loosen the four screws on the front and lift out the display (see also page 23).
2. Note down the color and position of the wires in the terminal blocks, and then loosen the terminal screws.
3. Unscrew the two screws that hold the metal cover and then remove it.
4. Unscrew the four screws that hold the mother PCB (the printed circuit board with all the electrical components).
5. Remove the mother PCB and look at the back side.
   This is what you should expect to see for a 230 V AC configuration:



230 V AC single jumper position

6. Unsolder and remove the jumper indicated by the arrow.

7. See on the following picture where two jumpers must be inserted for a 115 V AC configuration:



115 V AC dual jumper positions

8. Insert and solder 2 jumpers (wires) in the positions indicated by the black arrows.
9. Turn around the PCB and replace the 63 mAT fuse on the right side with a 125 mAT fuse (or vice versa going from 115 VAC to 230 VAC).
10. Re-insert the PCB and re-assemble the converter (see also steps 4, 3, 2 and 1).

Analogue Output

The analogue output is an active output with a maximum load of 800Ω.

Analogue Output		
Terminal		Designation
AO	+	4-20 mA
AO	-	4-20 mA

The analogue output can be programmed for indication of primary units.

See details on page 53.

Digital Output

Oxix® has two digital outputs - DO1 with an opto (light triggered) relay and DO2 with an electro-mechanical relay.

They can both be programmed for the following functions:

- Sensor error
- High and low alarms

Opto Relay		
Terminal		Designation
DO1	Com	Max. 50 V DC /120 mA
DO1	NO	

Electro-mechanical relay		
Terminal		Designation
DO2	Com	Max. 50 V DC /1 A
DO2	NO	

DO1 shares the common terminal (Com) with DI.

See also application examples in Appendix E. Digital Input/Output Connections on page 101.

Digital Input

Oxix® has one digital input which can be activated with a voltage higher than 10 V DC and de-activated with a voltage lower than 5 V DC.

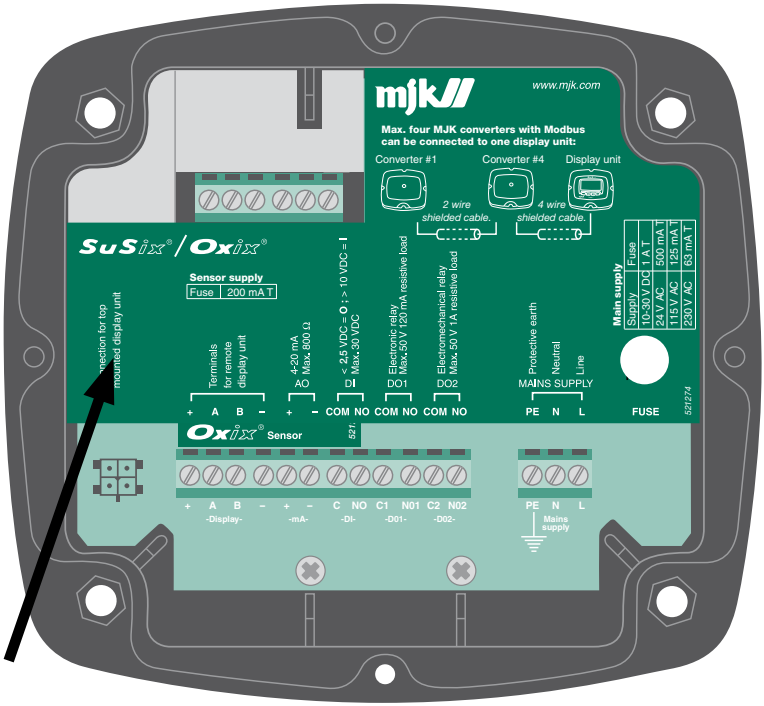
Digital Input		
Terminal		Designation
DI	Com	
DI		Max. 30 V DC

The digital input (DI) can be programmed for the following functions:

- start and pause cleaning function
- Solid curve

See also application examples in Appendix E. Digital Input/Output Connections on page 101.

Converter Terminals



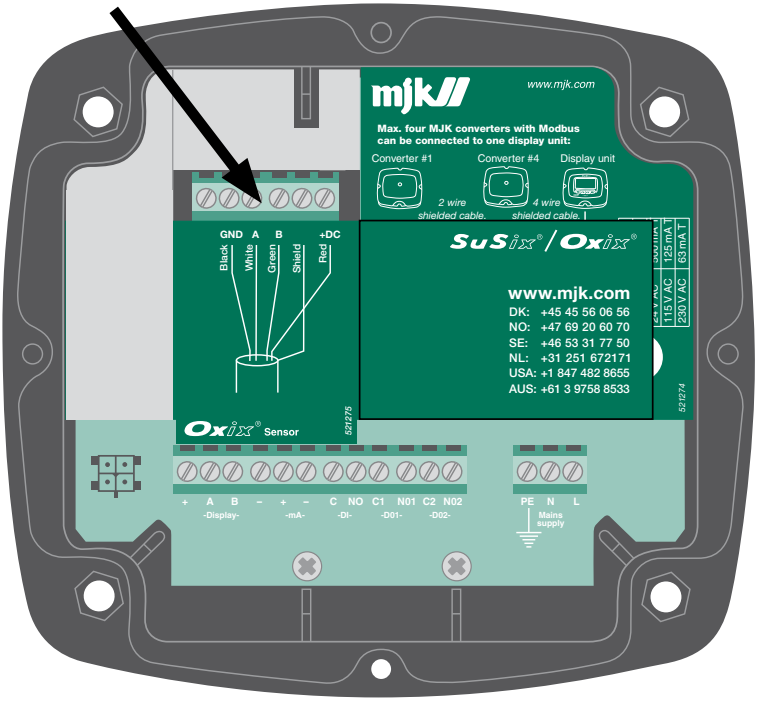
Oxix® converter terminals

Flip the green label with "SuSix® / Oxix®" printed on it (see arrow) to the right to gain access to the sensor connection terminals (see next page).

Sensor and Mounting Kit / Connection Board Terminals

Important!: Make sure the right wiring indication label is fitted below the terminal block (label indicated by arrow). The label must clearly be marked Oxix®.
Wrong wiring may cause sensor destruction !

Connect the sensor wires to the Oxix® converter with the wires coming from the sensor as shown below (see arrow).



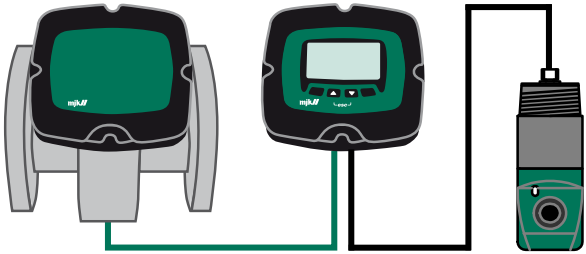
Oxix® converter terminals

Terminals	
Wires from sensor	**Converter terminals**
-	not used
Black	GND
White	A
Green	B
Shield	- (shield GND)
Red	+DC

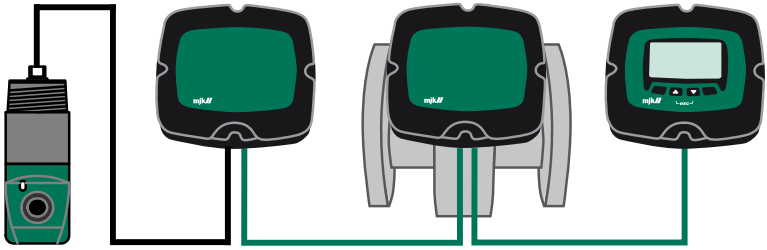
7. System Configuration Examples

MJK Oxix® transmitters share communication protocols with other MJK products like the MJK Magflux® flow meter and the MJK Connect data transmitter, and can also share display units. This section illustrates two configuration examples and includes cable connections and part numbers.

Magflux® with blind lid and Oxix® with display unit

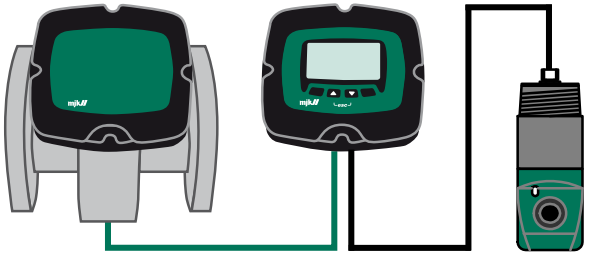


Oxix® with blind lid, Magflux® with blind lid and a remote display unit



Magflux® with Blind Lid and Oxix® with Display Unit

Configuration: Magflux® flow sensor/converter with a blind lid connected to a Oxix® transmitter with display unit



Part numbers for this configuration:

2x7xxx	***MagFlux***® Flow Sensor
2x7791x	***MagFlux***® Connverter with blind lid
579035	***MagFlux***® Gel Potting Kit IP68
	2-wire, shielded, twisted cable (Magflux® <--> Oxix®)
206510	***Oxix***® Sensor
206304-6	***SuSix***® /***Oxix***® Converter with Display Unit

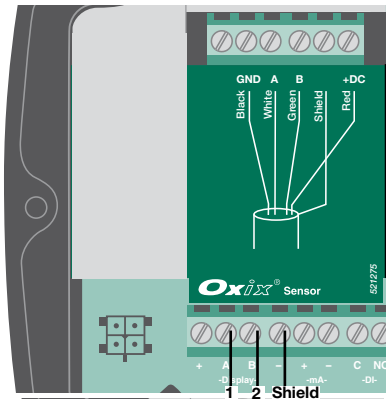
Wiring Schematic #1

for " Magflux® with Blind Lid and Oxix® with Display Unit" from the opposite page (page 32).

Oxix® with Display Unit

2-wire, shielded twisted cable

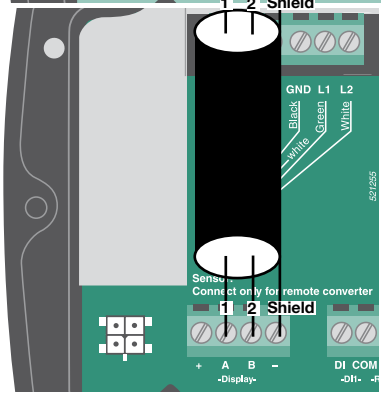
1. Connect lead "1" to slot "Display A"
2. Connect lead "2" to slot "Display B"
3. Connect the twisted shield to slot "Display -"



Magflux® with Blind Lid

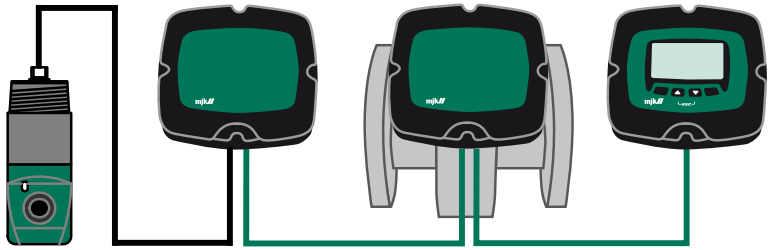
2-wire, shielded twisted cable

1. Connect lead "1" to slot "Display A"
2. Connect lead "2" to slot "Display B"
3. Connect the twisted shield to slot "Display -"



SuSix® with Blind Lid, Magflux® with Blind Lid and a Remote Display

Configuration: An Oxix® transmitter with a blind lid connected to a Magflux® flow sensor with a blind lid and common remote Display Unit.



Part numbers for this configuration:

206510	***Oxix®*** Sensor
206304-6	***SuSix®*** /***Oxix®*** Converter
2x7xxx	***MagFlux®*** Flow Sensor
2x791x	***MagFlux®*** Converter with blind lid
579035	***MagFlux®*** Gel Potting Kit IP68
207930	Wall Mounting Kit

2-wire, twisted shield cable (Oxix® <--> Magflux®)

4-wire, twisted shield cable (Magflux® <--> Display Unit)

Wiring Schematic #2

for "Oxix® with Blind Lid and a Magflux® with Blind Lid connected to a common wall mounted Display Unit" on the opposite page (page 34).

Oxix® with Blind Lid

2-wire, shielded twisted cable

1. Connect lead "1" to slot "Display A"
2. Connect lead "2" to slot "Display B"
3. Connect the twisted shield to slot "Display -"

Magflux® with Blind Lid

2-wire, shielded twisted cable

1. Connect lead "1" to slot "Display A"
2. Connect lead "2" to slot "Display B"
3. Connect the twisted shield to slot "Display -".

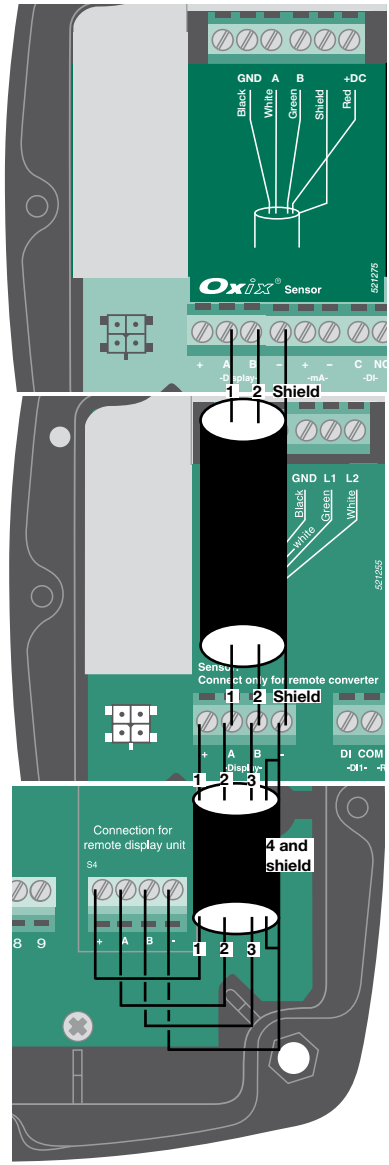
4-wire, shielded twisted cable

1. Connect lead "1" to slot "Display +"
2. Connect lead "2" to slot "Display A"
3. Connect lead "3" to slot "Display B"
4. Connect the twisted shield to slot "Display -".

Wall Mounted Display Unit

4-wire, shielded twisted cable

1. Connect lead "1" to slot "Display +"
2. Connect lead "2" to slot "Display A"
3. Connect lead "3" to slot "Display B"
4. Connect the twisted shield to slot "Display -".



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8. Startup

Initial Checks before Power-up

Before switching on power the following steps must be checked.

1. The local mains power supply voltage corresponds to the voltage printed on the identification label of the transmitter.
2. All electrical connections are made in accordance with the electrical connection diagram shown with special emphasis on the sensor connection described on page 30.
3. All terminal screws are tightened.
4. All cable glands are tightly secured.
5. All grounding connections are made in accordance with the instructions in this manual (see page 21).

Initial Power-up

1. Turn on power.
2. Within 60 seconds the Oxix® sensor will be found by the automatic sensor detection program. During this process you might briefly see "SuSix1" and/or "MagFlux1" on the display. This is normal and to be expected.

Initial Measurement

1. Make sure that the sensor is completely covered by liquid.
2. Turn on power to the transmitter and wait 15 minutes before taking the initial measurement.

Language Selection

1. The default display language is English. If another language is required, proceed with step 2.
2. Select "Display Setup" from the Main Menu.
3. Select "Language" from the Display Setup menu and chose the required language (see page 73).

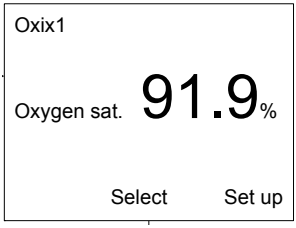
Display Read-out, one connected unit

All ***Oxix***® display read-outs are illustrated and described in this manual.

Chapter 6. Oxix® Menus (on page 41) gives a detailed description of the 5-line LCD screen displays shown during setup, configuration and normal operation.

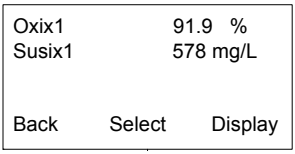
Display and keyboard for reading and programming

The display shown above will in the remaining part of this manual be stylized to appear like this:

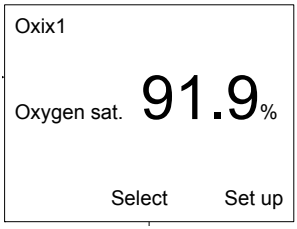


Display Read-out, several connected units

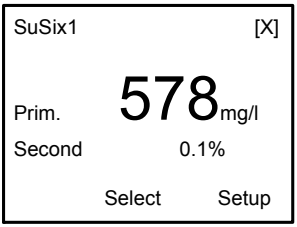
When several MJK units are interconnected, for example an Oxix® dissolved oxygen transmitter and a SuSix® turbidity and suspended solids transmitter with different names and Modbus ID numbers, a "Display Overview Menu" is available at top level (press "Back" repeatedly):



All connected units are displayed and sorted by their ID numbers, and consequently each unit can be selected and set up as required:



or



Important:
More connected units can only by managed as described above, if each unit have been assigned a unique name and Modbus ID number. See page 75 ***for details.***

Display Keys

The keys and the soft keys (variable key functions determined by the display firmware) are used for initial programming and normal operation of the flow meter.

The function(s) of the four available keys is displayed at the bottom of the display. The symbols and actual functions are described in detail in the sections that describe the individual menus.

Contrast Adjustment

Adjust the display contrast by pressing the two outmost keys simultaneously (indicated by the keys) and press the up/down keys as required.

Save the new setting by pressing the two outmost keys simultaneously.

System Reset

You can reset and refresh all system displays and key combinations by pressing all four keys simultaneously. It is a so-called coldboot, where all displays are refreshed and all settings/configurations are kept with only one exception: the language setting.

This feature is especially useful during for example a service call, where the display language (Dutch, Danish, Swedish etc.) cannot be understood by the local serviceperson. A system reset immediately sets the display language to (GB) English.

The system reset must not be confused with the ultimate "Recover factory settings" (see page 60) which deletes all local configurations/settings and replaces them with default factory settings.

9. Oxix® Menus

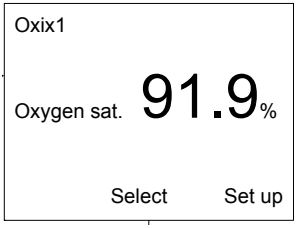
All the ***Oxix®*** menus and sub menus are shown and described in the following sections.

Continous overviews of the menu and sub-menu structures are presented at the end of this manual:

- ***Converter Overview Menu*** (page 102)
- ***Main Menu Overview*** (page 102)
- ***Converter Setup Overview*** (page 106)
- ***Service Menu Overview*** (page 114)
- ***Display Setup Menu Overview*** (page 120)

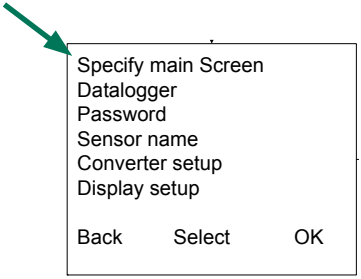
Converter Overview Menu

1. Press the "Setup" key on the ***Oxix®*** display (see below) to enter the ***Oxix®*** Converter Overview Menu.



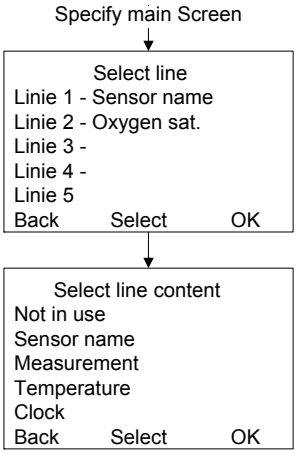
Main Menu

2. Press the up/down keys to highlight the required menu line in the Main Menu (here: Specify main screen) and then press OK to select it.



Specify Main Screen

The "Specify Main Screen" menu allows you to customize the ***Oxix®*** display to suit your requirements. You can add and remove five available display lines and name/configure them individually.



1. Press the up/down keys to highlight the required menu line and then press OK to select it.
2. Press the up/down keys to highlight the required option and press OK.

The available options are:

Not in use

The line not used. The freed space will be used by the other lines.

Sensor name

TBD

Measurement

Measurement displays the measured values in time in the predefined unit: %, mg/l or ppm.

Note: The units are defined later on in the "Converter setup/Units" menu on page 52.

Temperature

The temperature may be displayed in degrees Celcius (ºC) or in degrees Fahrenheit (ºF). See also page 52.

Clock

Time and date

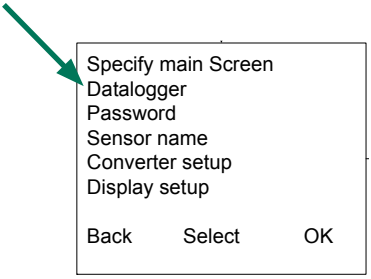
The size of the display lines will automatically increase or decrease as the number of display lines is removed or added to maximize the field of view for the measured values

Datalogger

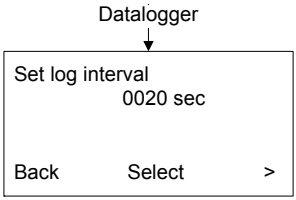
Oxix® provides a data logger with a capacity of approx. 20,000 entry points. See Appendix D on page 97 for examples and descriptions of log files.

The data logger operates after the FIFO principle (First In, First Out). If the data logger is full and new data are coming in, the oldest data are discarded.

1. Press the up/down keys to highlight the required menu line (here: Datalogger) and then press OK to select it.



2. Press the up/down keys to change the highlighted digit, and then press the right-key (>) to proceed to the next digit.



3. Continue until all digits have been set and press OK.
   The log interval can be set in intervals from 10 seconds up to 9999 seconds.

The data log contains:

- Date
- Time
- Dissolved oxygen values

In case of a power failure, the data logger continues when power returns.

If more converters are connected to one Display Unit, each converter has its own individual log interval and can be sorted.

All converters share the same memory of 20.000 entry points.

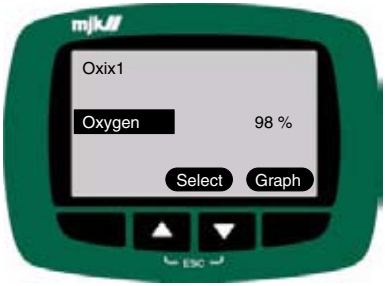
The log data can be shown on the Display Unit or be stored in an external CSV file. MJK-Field Link software is needed for transfer of data into CSV file format via the USB port in the display unit. The format can be read in for example Microsoft® Excel® (see Appendix D on page 97 for details).

An example of the log capacity of one sensor versus the time interval is shown in the following table.

Log interval		Log capacity	
Seconds	**Minutes**	**Hours**	**Days**
10	-	55,56	2,31
30	-	166,67	6,94
-	1	333	14
-	5	1667	69
-	10	3333	139
-	30	10000	417
-	60	20000	833

Graph Display

The content of the Data Logger can displayed on the Display Unit by pressing the up/down keys, highlighting "Oxygen sat." and selecting "Graph"



The Display Unit then shows the Graph screen. To return to the Main Menu display screen, select "esc" by pressing the up/down keys simultaneously.

The Y axis is automatically scaled according to the maximum value of the mA output.

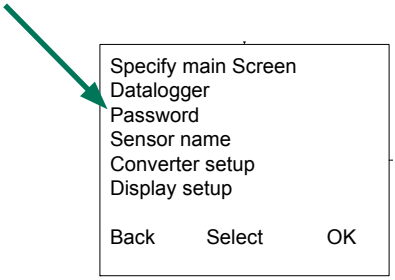
Double-arrow keys jump forward and backward one screen frame at a time. Single-arrow keys move the cursor forward and backward on the screen.

The actual values at the cursor position is shown at the bottom of the screen.

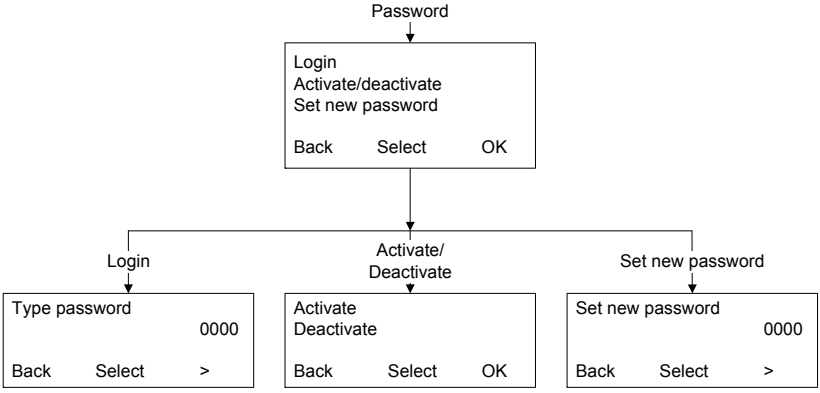
Password

A password provides (and prevents) access to all the settings in the Display and Converter unit. The code consists of a numeric 5-digit code between 0 and 65535. If your current password is lost or forgotten, contact MJK for instructions.

1. Press the up/down keys to highlight the required menu line (here: Password) and then press OK to select it.



2. Press the up/down keys to highlight the required option and then press OK to select it.



The available options are:

Login

Use the up/down keys to set the digits one by one. Continue with > until all digits have been set and then press OK.

Activate/deactivate

Write protection. Selecting "Activate" means that a password must be entered to change vital settings. "Deactivate" disables password protection. If your current password is lost or forgotten, the password protection can be overruled with the code "01750".

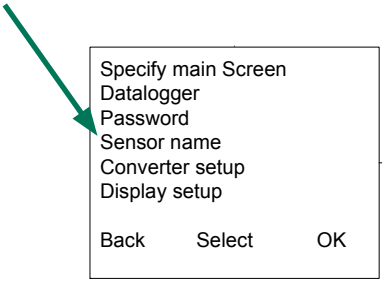
Change password

The present 5-digit password can be changed as required.

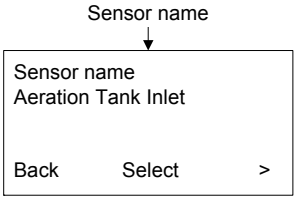
Sensor Name

A unique name and/or number, a function or a location can be assigned for a sensor (here: "Oxix1"). It is consequently shown on the main display with up to 4 display lines.

1. Press the up/down keys to highlight the required menu line (here: Sensor Name) and then press OK to select it.



2. To change the default sensor name "Oxix1" to for example "Aeration Tank Inlet", press the left/right keys to highlight the wanted character.



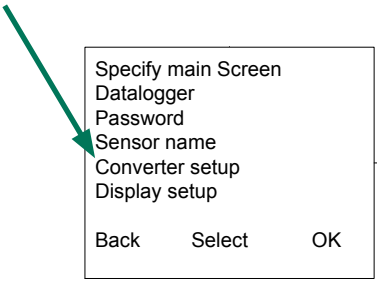
3. Press the up/down keys to change the highlighted character and then press > to proceed to the next character.
4. Continue with > until all numeric and alphabetical characters have been set.
5. Press OK.

The available characters depend on the chosen language. English, for example, provides the following character set:
a b c d e f g h i j k l m n o p q r s t u v w x y z A B C D E F G H I J K L M N O P Q R S T U V W X Y Z <space> 1 2 3 4 5 6 7 8 9 and 0.

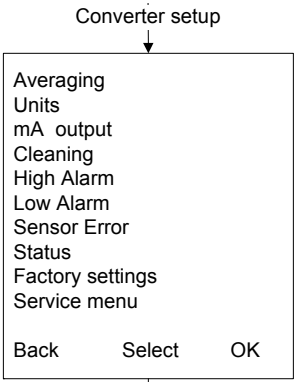
Converter Setup

"Converter setup" provides configuration options for calibration, alarms, units, etc. See detailed descriptions in the following sections, and a continuous overview on page 106 at the end of this manual.

1. Press the up/down keys to highlight the required menu line (here: Converter setup) and then press OK to select it.

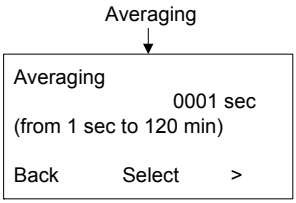


2. A number of options appears beginning with "Averaging":



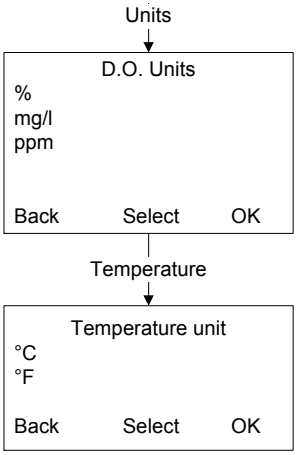
Averaging

To avoid unwanted fluctuations in the measurement reading, the "Averaging" options smoothes the measurements over a predefined period of time.



Units

The measuring and temperature units can be set from this menu.

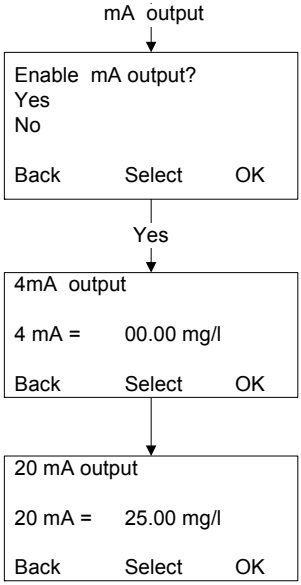


mA Output

When a ***Oxix®*** is connected to a power supply for the first time, the mA output is automatically set to provide 4 mA at zero and 20 mA at the theoretical maximum value.

Changes in the mA setting will not affect the relay output settings.

Note: Both values can be set in the range 10 % to 120 %, making it possible to increase or decrease the mA signal.



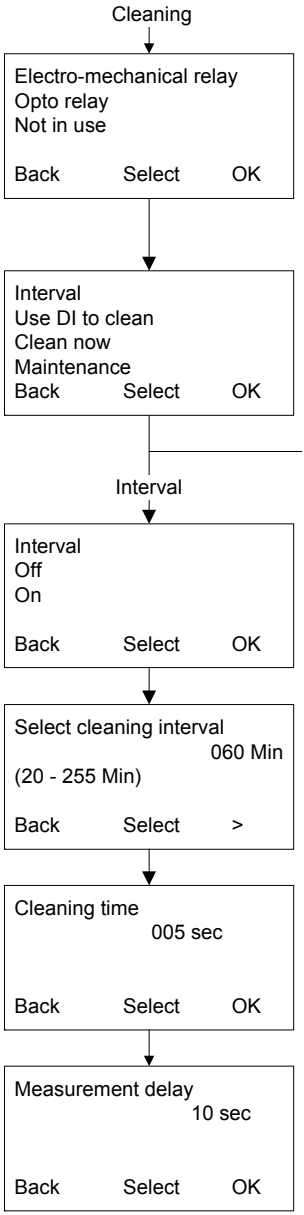
The mA output is an active output, and the maximum load is 800 Ohm.

The upper limit for the mA output is 20,5 mA

3,75 mA indicates the mA output is not in use
3,5 mA indicates values under 4 mA level
20,5 mA indicates value higher than 20 mA level.

Cleaning

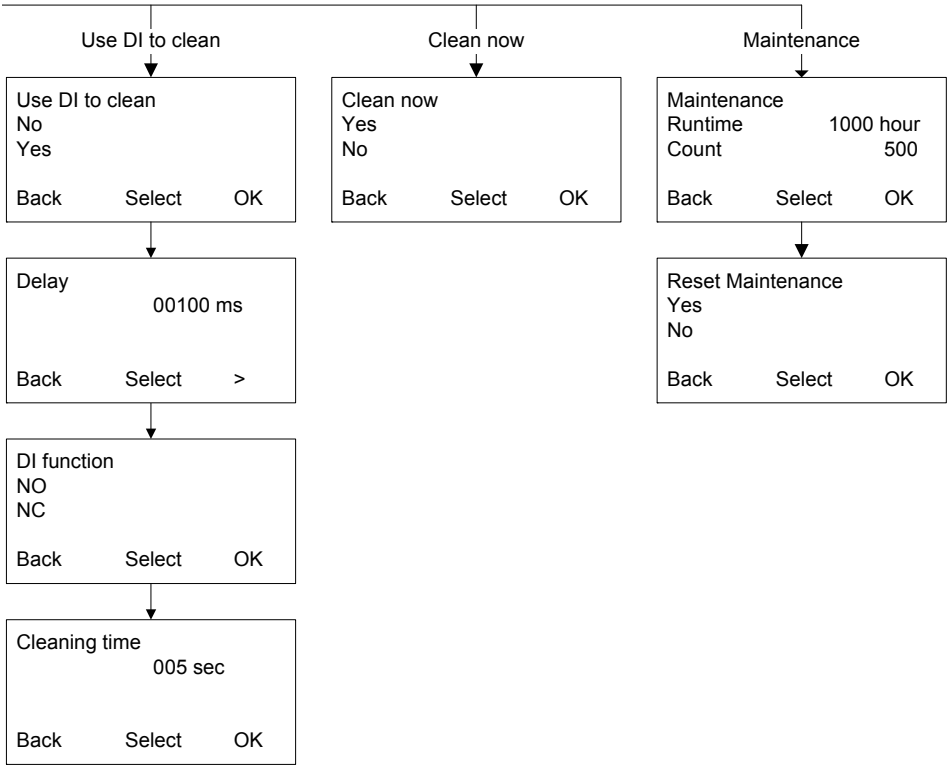
Air or water jet cleaning can be defined based on local conditions.



A typical cleaning interval for aeration basins would be 2 hours (120 minutes). In colder climates, condensation may form and then freeze in the tubing. This can be prevented by setting the interval to 5 - 20 minutes.

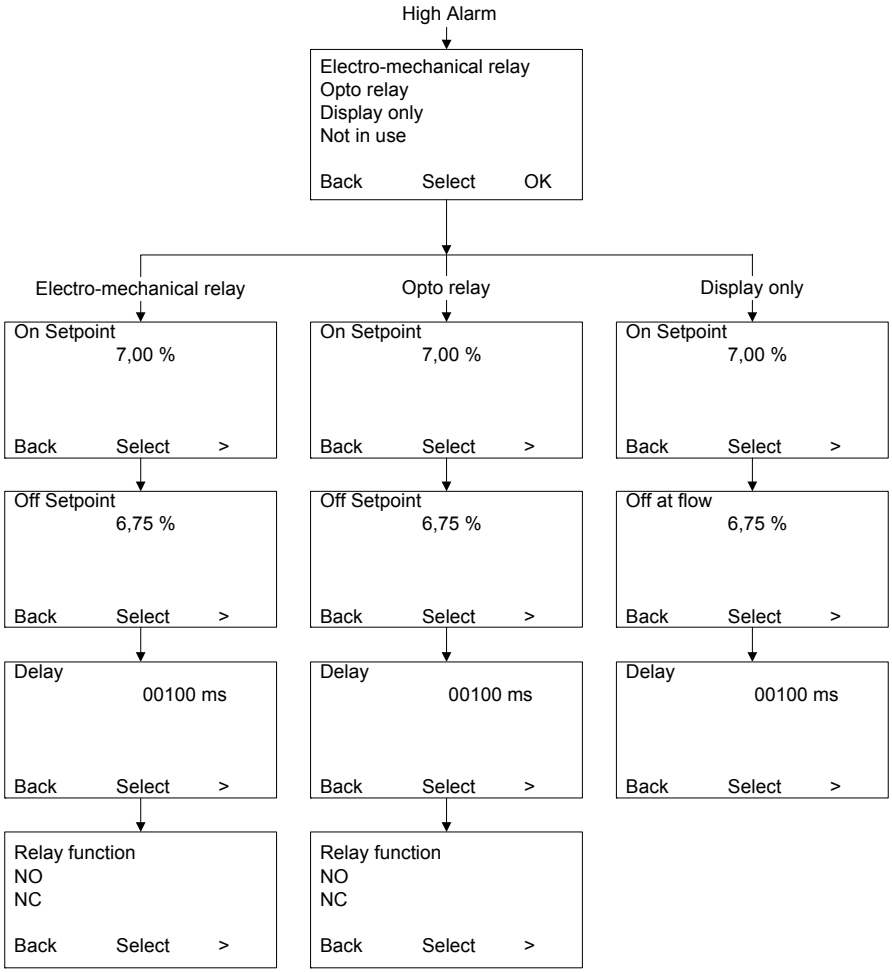
The cleaning time would typically be 30 seconds.

The measurement delay (recovery time) may also be used to coordinate with other processes. The delay merely freezes the last reading before cleaning begins. A typical value would be 60 seconds.



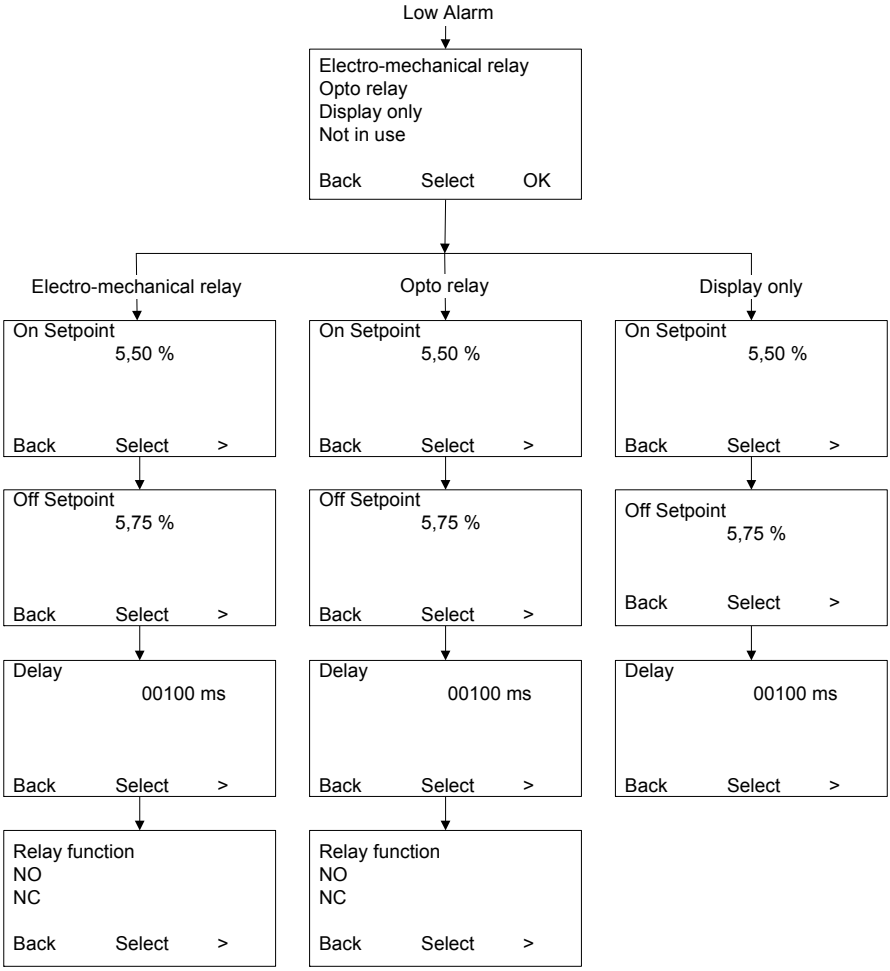
High alarm

A set point can be set to trigger an alarm (here: a high alarm) and to activate one of two relays or simply to display the alarm on the display.



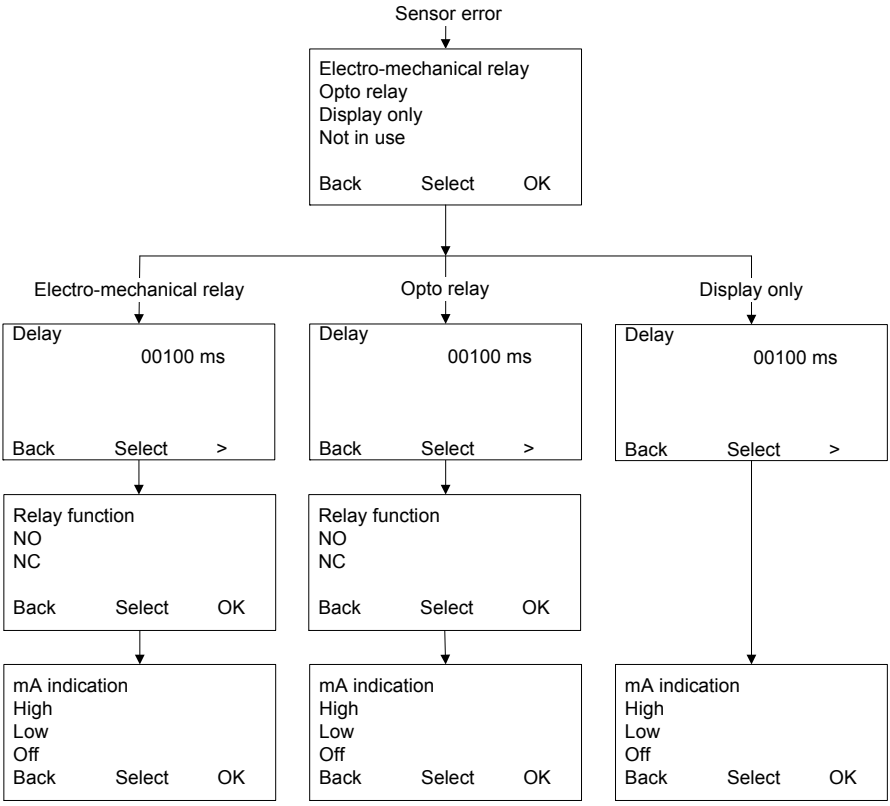
Low alarm

A set point can be set to trigger an alarm (here: a low alarm) and to activate one of two relays or simply to display the alarm on the display.



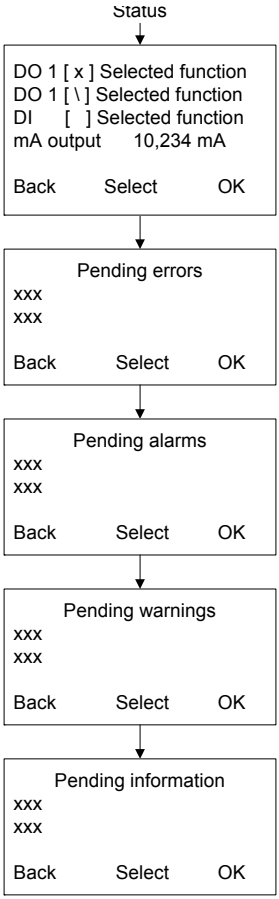
Sensor error

Oxix® has two digital outputs - DO1 with an opto (light triggered) relay and DO2 with an electro-mechanical relay. They can both be programmed for a sensor error, whenever the 4 - 20 mA range has been exceeded.



Status

The "Status" option provides an overview of the in- and output status.



The check boxes can contain four different characters:

- **X** A cross (X) in a check box indicates an active state
- **/** A blinking forward slant (/) in a check box indicates that the input/ output is in the process of being activated. Eventually it turns into a steady X.

\ A blinking backward slant (\) in a check box indicates that the input/output is in the process of being de-activated. Eventually the check box is cleared.

An empty check box indicates a de-activated state.

DO 1 [X] Selected function

The selected function linked to digital output D01 is active (an "X" in the check box).

DO 2 [X] Selected function

The selected function linked to digital output D02 is in the process of being de-activated (an "X" in the check box).Digital output D02 for Totalizer Forward is activated (a ticked check box).

DI [ ] Selected function

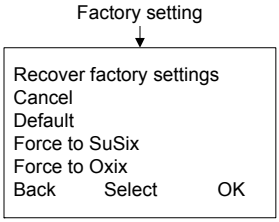
The selected function linked to digital input DI de-activated (an empty check box). A "selected function" could for example be "Cleaning".

mA output 10.234 mA

The present analog output current is 10.234 mA. Pending errors, alarms, warnings and infos are displayed for the selected in- or output.

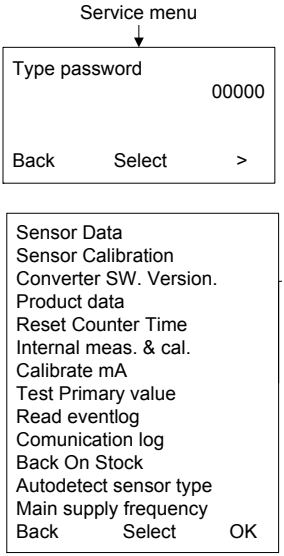
Factory settings

The "Factory settings" menu provides resetting to the original factory settings (except for the language setting).



Service Menu - Digest

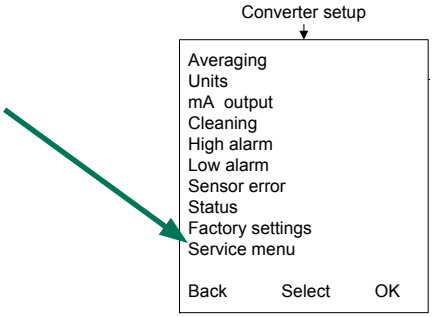
The "Service Menu" provides options intended for service personnel during installation, calibration, operation, monitoring and maintenance.



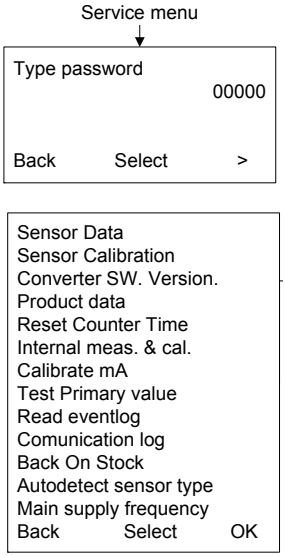
All parameters can be read without any restrictions, but certain parameters can only by changed after a password has been typed.

Service Menu - Detailed

The "Service Menu", a submenu in "Converter setup", is intended for MJK and other authorized service personnel during installation, calibration, commissioning, operation, monitoring and maintenance.

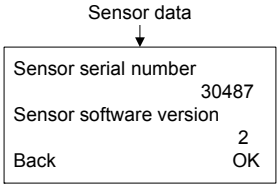


All parameters can be read without any restrictions, but certain parameters can only by changed after a password has been typed.



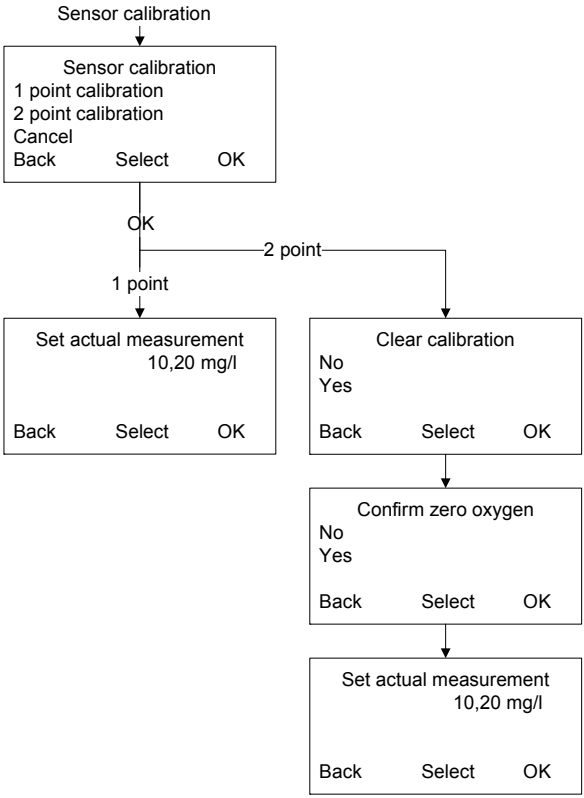
Sensor data

"Sensor data" displays the factory-assigned sensor serial number and the present sensor software version.



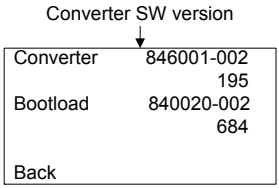
Sensor calibration

Sensor calibration is read-only. Only MJK servicepersons can access the option using the proper password.



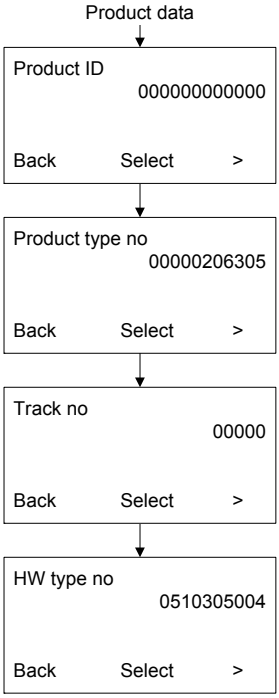
Converter SW ver.

The converter software version and the bootload version are displayed. From that you can determine whether a software (firmware) upgrade is required or not.



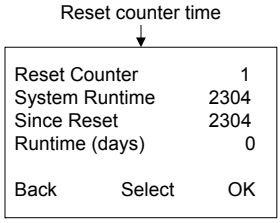
Product Data

Key product data like ID, hardware type no., track no. and HW type no. are displayed.



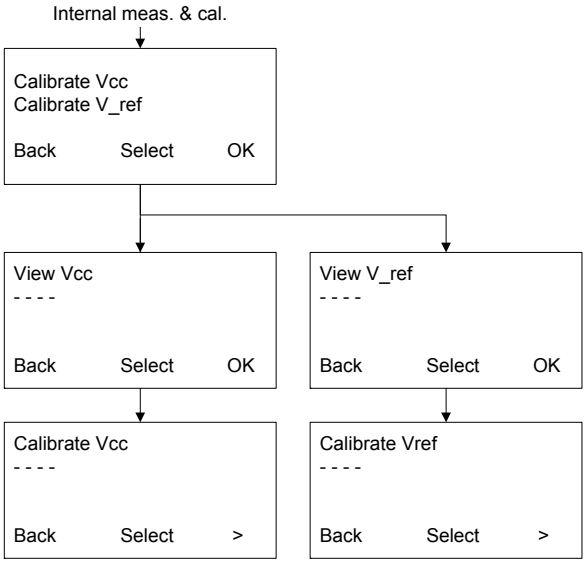
Reset Counter Time

The counter can be reset for fault finding, error correction and similar service procedures, and the actual runtime is displayed.



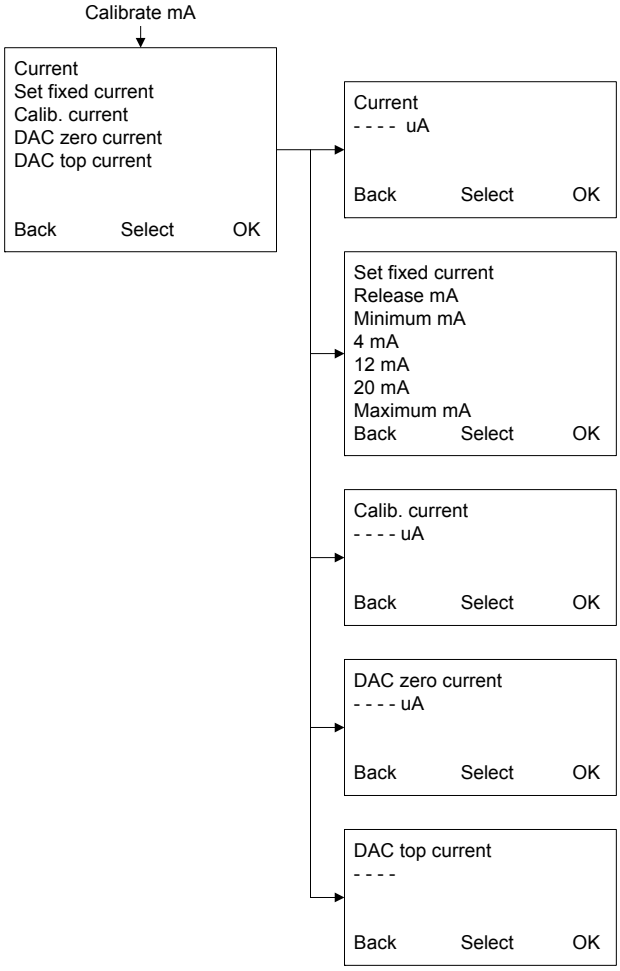
Internal Meas. & Cal.

Internal measurements and calibrations are for service personnel use only! The supply voltage (Vcc) and the reference voltage (Vref) can be viewed and adjusted.



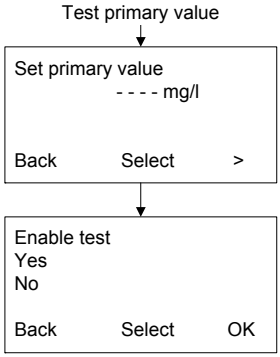
Calibrate mA

From this menu the mA reading can be calibrated against a multimeter.



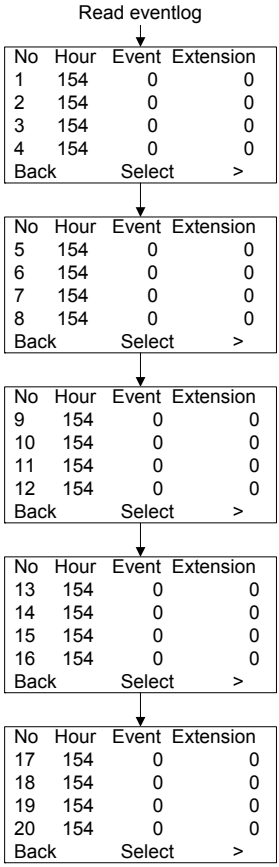
Test primary value

"Test primary value" is for MJK service personnel use only. It can be set to for example 100% to test a state or condition for a given input value.



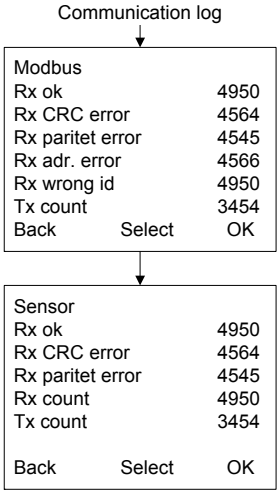
Read Eventlog

View the events within a certain time frame.



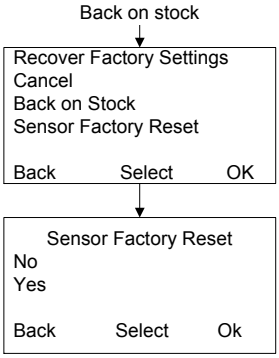
Communication log

View the Modbus and sensor communication logs. Primarily intended for fault detection.



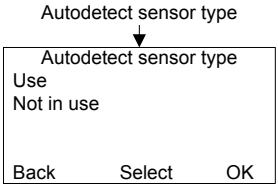
Back on stock

The factory settings can be re-etablished with the "Back on stock" option.



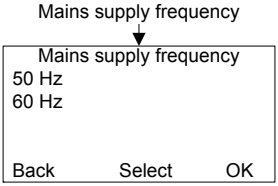
Autodetect sensor type

The option can be toggled as required. "Use" is the factory default setting.



Mains supply frequency

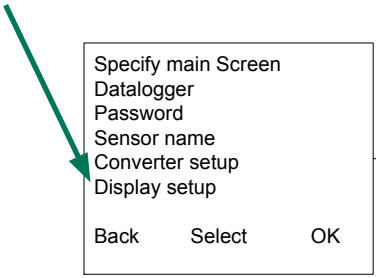
Select the national/local mains supply frequency: 50 Hz for Europe, Africa, Asia, Australia and South America, and 60 Hz for USA, Canada, Mexico, Latin America and the Carabian.



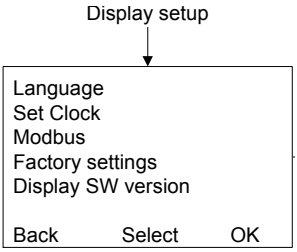
Display Setup

The "Display Setup" menu provides options for language, clock and factory settings, Modbus parameters and software version display.

1. Press the up/down keys to highlight the required menu line (here: Display setup) and then press OK to select it.



2. Press the up/down keys to highlight the required optione and then press OK.



The available options are described in detail on the following pages.

Language

The Oxix® is installed with a language package, and (GB) English is the default language.

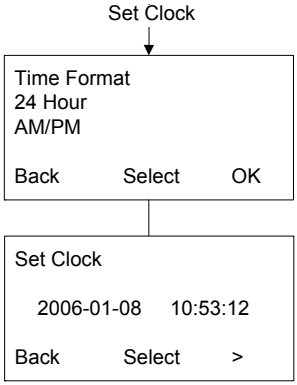
In the "Language" menu several national languages can be selected.

Additional languages can be added using the MJK-Field Link software program (see also page 94).

1. Chose the required language using the up/down keys up and then press OK.

Set clock

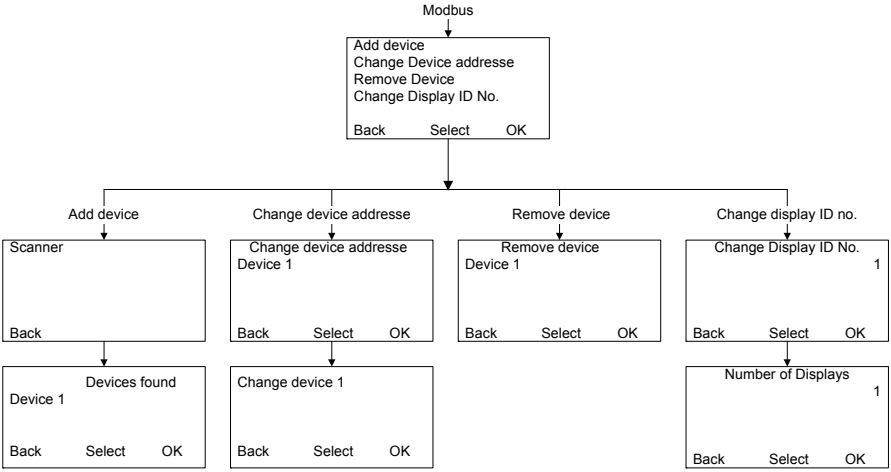
The "Set clock" menu provides setting of the built-in clock and the time format.



1. Select the date and time digits with the left/right keys and change the setting with the up/down keys.
2. Press OK and repeat step 1 for all remaining digits.
3. Press OK to save the time/clock settings.

Modbus

The Oxix® is delivered with a standard Modbus RTU protocol, and up to four Oxix® ,Connect® and/or MagFlux® units can be connected for concurrent operation.



When several converters are to be added, you must change each converter's device address to a unique Modbus ID address before connecting the converter to the Display Unit.

Add device

Four Oxix® Converters can be connected to one Display Unit using the RS485 interface connection. Note that only one Display Unit can be used with several converters.

The Display Unit can easily be moved to another converters for readout and configuration.

1. Select "Add Device", click OK and wait for the scan process to finish.
2. The found converters are finally displayed.

Change device address

To change each converter's device adress it is required that you connect the Display Unit to each converter one by one to change each converter's device address. If neglected, a conflict between the units will arise when the RS 485 serial loop is established.

Change for example "Device 1" to "Device 2" as follows:

1. Press OK and use the up/down keys to change "1" to "2".
2. Press OK.

The Oxix® converter ID is now changed to "2", and more converters can be added to the Display Unit with the "Add Device" option.

Remove Device

If a device is to be removed from the Display Unit, proceed as follows:

1. Select the required device with the up/down keys.
2. Click OK to remove it.

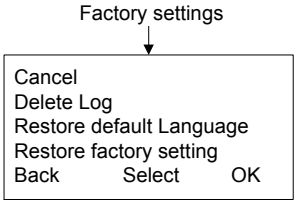
The device is now removed from the Display unit and display returns to the "Modbus" menu.

Change controller ID (display)

The display controller ID must be changed when several displays operate with the same converter(s)

Factory settings

The "Factory settings" menu provides log deletion and resetting to factory settings of the display unit.



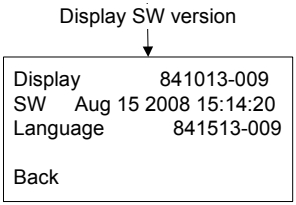
1. Press the up/down keys to highlight the required option and press OK.

Important:

The data logger will be reset, and all devices will be deleted from the display Unit. This is indicated by the MJK start-up screen which is displayed within a few seconds.

Display SW version

The "Display SW version" menu provides a read-out of the display software (actually firmware) version, the build date and last-edited date of the the multiple languages file.



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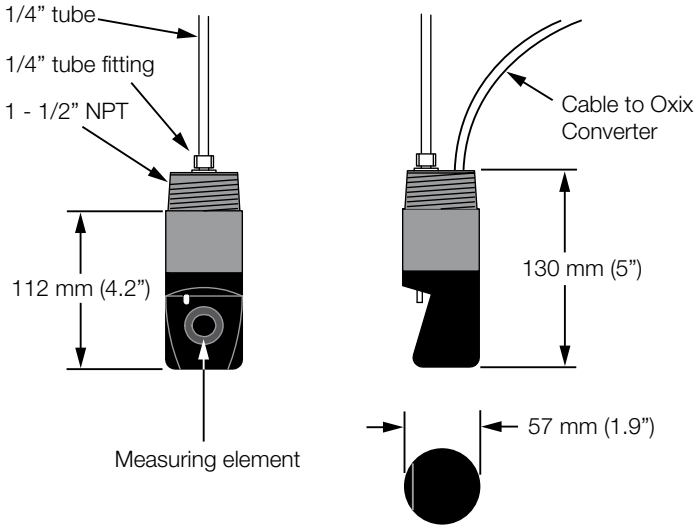
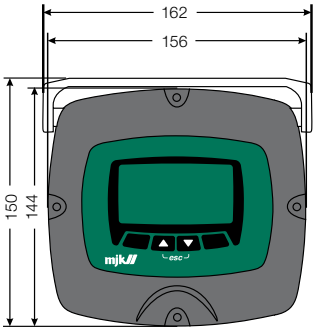
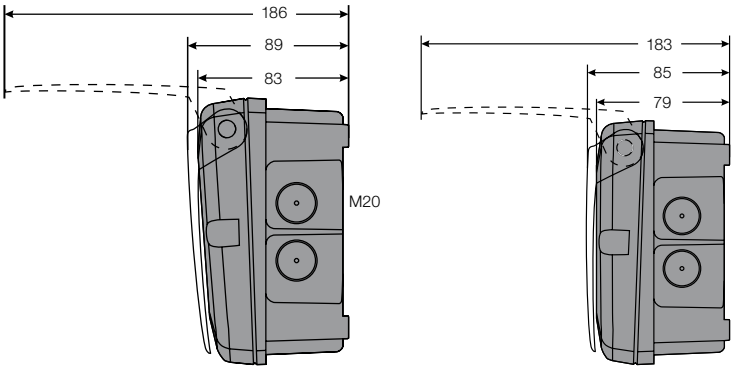
10. Mechanical Dimensions

Sensor

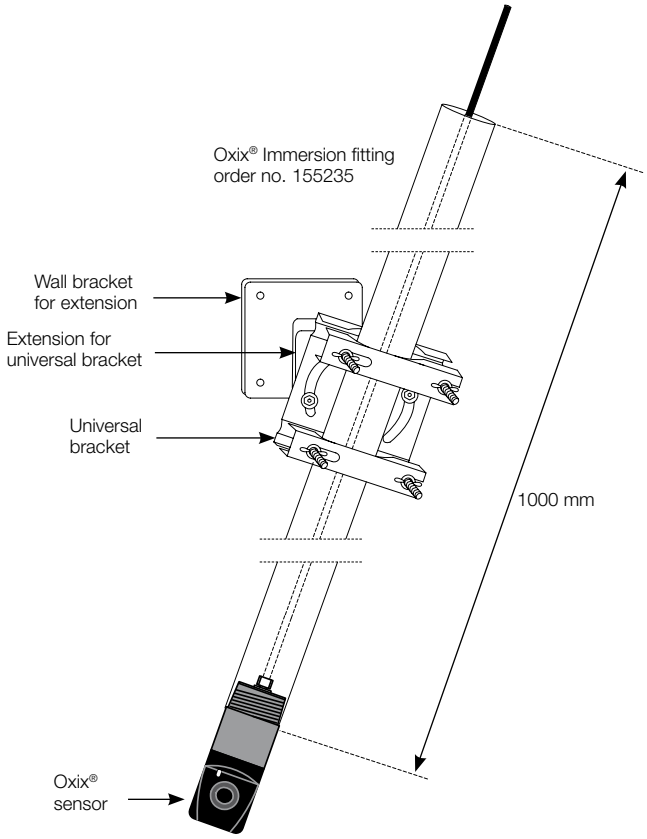


Converter and Display Unit





Immersion Fitting



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11. Maintenance

The Oxix® sensor requires no maintenance as such. It may, however, be cleaned on a regular basis to maintain its maximum accuracy.

In very slimy environments the built-in water or air jet function may be used with advantage.

Clean the transmitter for example once a month to begin with, until an optimal cleaning interval can be determined.

Cleaning the sensor

1. Remove the Oxix® sensor from the liquid.
2. Clean the sensor with a soft, moist cloth and clean water. A mild detergent or dishwashing liquid may be used.

   Warning: The accuracy will deteriorate, or be completely ruined at the worst, if the measuring optic element is scratched by for example the use of a steel brush during cleaning.
3. Dry the sensor with a soft cloth.
4. Immerse the Oxix® sensor into the liquid to be measured and leave it for at least 15 minutes to stabilize the reading.
5. The cleaning intervals may need to be shortened or extended, all depending on the usage, the liquid composition and the location.

Cleaning the converter display

When seen necessary the Oxix® converter display may be cleaned with a soft, moist cloth.

Functional Tests

The Oxix® transmitter calibration can, if wanted, be checked from the service menu option "Sensor calibration". This option is read-only. In the unlikely event that the unit fall out of calibration, an MJK serviceperson must be called to fix or re-calibrate the transmitter.

Service Contract

A service contract maintains the equipment reliability and accuracy. Get in contact with MJK's national sales and service representatives.

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Appendix A. Pop-up and Error Messages

Alarms	
Current overrange	**Alarm** - The mA connection has exceeded the 4 - 20 mA range. For example 3,5 or 20,5 mA.
Factory reset occurred	**Alarm** - A factory reset has occured. Some settings have changed. Check all used settings.
High alarm	**Alarm** - The high set point has been detected.
Low alarm	**Alarm** - The low set point has been detected.
mA connection	**Alarm** - The mA connection is not connected. If the current-out is used, deactivate mA Current out to stop this alarm.
Errors	
Calibration	**Error** - 1. Perform calibration (see page 21) and/or check the units and ranges (see page 52).
Eeprom write error	**Error** - Eeprom write error. If error keeps popping up, contact MJK.
Measuring start failed	**Error** - Start failed. Try again.
Measuring timeout	**Error** - Timeout. Try again.
Missing adjustment	**Error** - The measured value has not been entered.
Not in solid mode!	**Error** - Calibration can only be performed when in solid mode. Change mode and try again.

Sensor	**Error** - General sensor error that may also be transferred to a relay output. Contact MJK.
Sensor communication	**Error** - Modbus communication errrors normally imply that a device has been moved, added, removed or has changed status in an illegal manner. Rearranged cables or wires can also invoke this error message. Reset the system to cancel the error condition.
Sensor hardware	**Error** - Change the sensor hardware.
Sensor setting	**Error** - Some settings are wrong or have been changed.
Sensor supply	**Error** - The sensor supply is too low or too high. Check the sensor cable connection.
System	**Error** - Internal VCC error. See the event log for details.
System error	**Error** - The system software is inoperable including faulty alarm and sensor bits. Contact MJK.
D.O. offset	**Error** - A zero-point sensor problem. The sensor needs a zero-point calibration. Contact MJK.
Warnings	
Sensor range exceeded	**Warning** - The measured value is out of range. Check the measuring range and the measuring units.
Info	
Measurement hold	**Info** - The measurement is set on hold during the cleaning cycle or by an error.
Sensor needs cleaning	**Info** - The sensor needs cleaning.
System reset occurred	**Info** - The converter has been subject to a software or hardware reset.

USB	
Flash programming please wait	Programming is in progress but not finished.
Flash programming done	Programming is finished.
Flash crc error	Cyclic redundancy check error.
Unknown command flash user text	Unvalid command issued.
Flash address overrun	A write error hos occured.
File phase error	Internal USB error.
File write failure	A write error hos occured.
USB protocol overrun	A communication error has occured.

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Appendix B. MJK-Field Link Software

The MJK-Field Link software package provides several utilities that will be described in detail on the following pages:

- PC <-> Oxix® transmitter interconnection
- Saving log data
- Display firmware upgrade
- Converter firmware upgrade
- Language installation

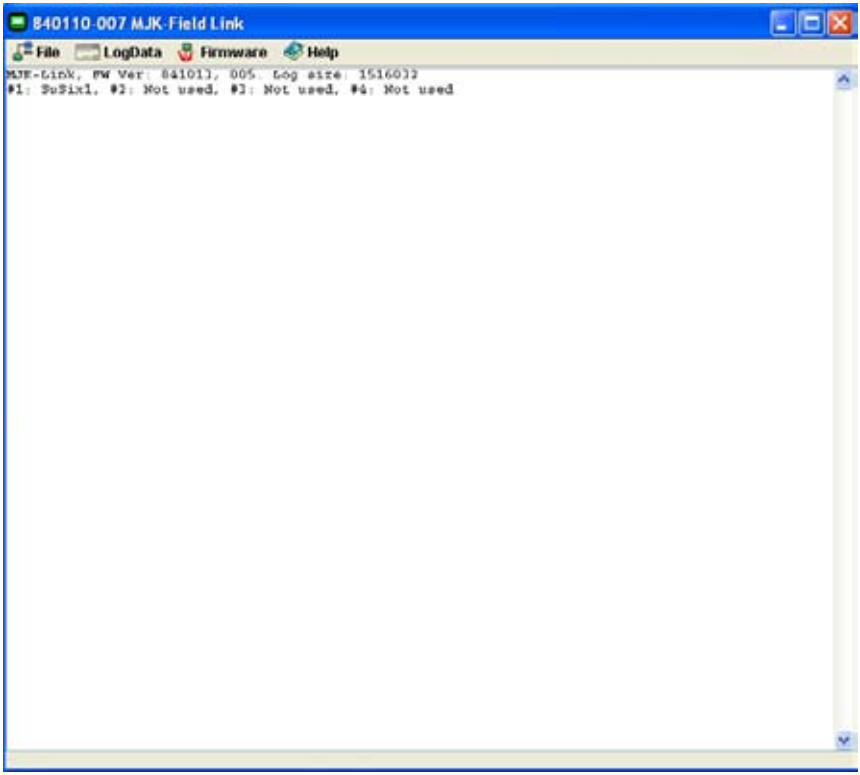
Important Notes!

1. Current Oxix® log data must be saved in a file before transferring and installing new firmware. See "2. Save Log Data" overleaf.
2. Note down all display and converter settings before upgrading new firmware.
3. The upgrade procedures below must be carried out in strict alphabetical order. First procedure A, then B, C, D and finally E.

A. Connect a PC to the Oxix®

1. Insert the Oxix® MJK-Field Link CD-ROM into the PC's disk drive. The MJK-Field Link opening menu will appear after a short while (see below). If the auto-run function does not execute, locate the "MJK-Field-Link 840110-007.exe" file (or a similar file) and click "Run".

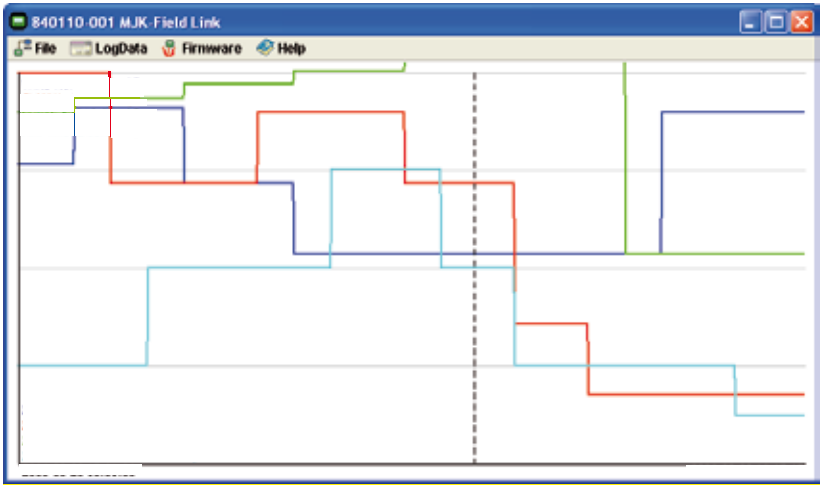
2. Unscrew the four screws that hold the Display Unit.
3. Lift out the Display Unit and connect a USB mini A/B cable to the mini USB female B connector on the rear of the front panel.
4. Connect the other end of the USB cable (max. 4.7 metres long) to the PC.
5. Select "File" in the menu bar and click "Mount USB".
   If the connection is successful, a "Device Clock" window for PC and device time synchronisation is displayed (if PC and device clock were out of sync.) along with a link status display (see below).



If the connection fails, first remove the cable and then re-connect it.

B. Save Log Data

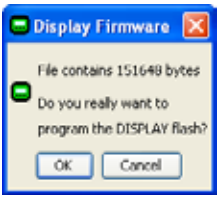
1. Select "LogData" in the menu bar and click "Save Log to File".
2. Assign a file name, find the destination you want to save the file to, and click "Save". Consequently the file is saved, and the contents is displayed.



C. Upgrade Display Firmware

Important: Always upgrade the display firmware before you upgrade the converter software.

1. Select "Firmware" in the menu bar and click "Display".
2. Locate the "MJK Field FW" directory on the CD-ROM, select the 841xxx-xxx.hex file (or similar 841*.hex) and click "Open".
3. Click OK when the "Display Firmware" dialogue box appears and prompts for programming the display Flash memory.



The display unit firmware is then transferred, and the display unit is consequently programmed. Expect this process to take a few minutes.

4. A "Searching for MJK-Field" dialogue box then appears and prompts for disconnecting and re-connecting the USB cable.

   Do as suggested and click OK.

5. Meanwhile the ***Oxix***® Display Unit restarts and displays the MJK logo, the new link status is displayed, and the Display Unit informs that the PC is once again connected.
   Click OK on the PC and the ***Oxix***® Display Unit to return to the ***Oxix***®.
6. Adjust the ***Oxix***® Display Unit screen contrast by pressing the two outmost keys simultaneously (indicated by the keys) and press the up/down keys as required.

7. Save the new setting by again pressing the two outmost keys simultaneously.

D. Upgrade Converter Firmware

1. Select "Firmware" in the menu bar and click "Converter".
2. Locate the "MJK Field FW" directory on the CD-ROM, select the "842xxx-xxx.hex" file (or similar) and click "Open".
3. Select the required ***Oxix***® (option 1, 2, 3 or 4) and click OK when the "Converter Firmware" dialogue box appears and prompts for selecting the converter to program.

The converter firmware is then transferred, and the converter Flash programming is initiated. Expect this process to take a few minutes.

4. When the Flash programming is done, click OK on the PC and the ***Oxix***® Display Unit to return to the ***Oxix***® display.
5. If required you may adjust the ***Oxix***® Display Unit screen contrast by pressing the two outmost keys simultaneously, press the up/down keys as required, and save the new setting by again pressing the two outmost keys simultaneously.

E. Install/Add Languages

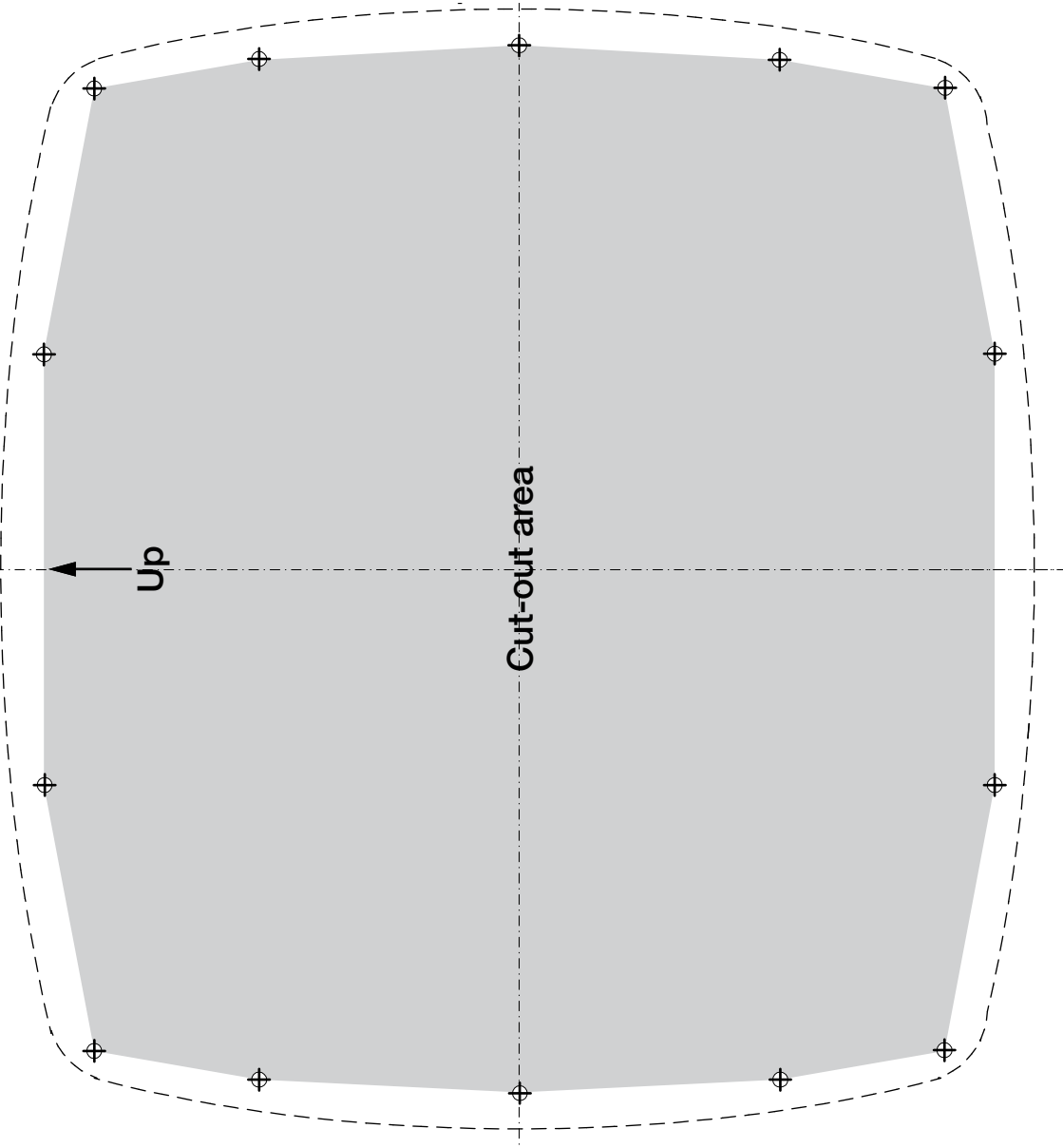
All languages are removed during a display firmware upgrade. Consequently the required languages must be re-installed at this stage.

1. Select "File" in the menu bar and click "Languages".
2. A dialogue appears showing the currently installed languages (none following a firmware upgrade).
   You can now either add or delete the required languages.
3. Click "Add", select the required language text file (or language pack) in the "MJK Field Display Unit text files" directory on the CD-ROM (for example 841513-008.txt) and click "Open".
4. Select for example "841500 J Europe N+W+S+US" in the "Add Language" dialogue box (N+W+S+US = North, West, South and USA) and click OK.

5. The languages are then transferred and loaded.
   If required, you can remove one or more languages by selecting them from the list, clicking "Delete" and "Close".

Appendix C. Front Panel Cut-out Drawing

The dotted line indicates the front panel outline and measures 155 x 145 mm.



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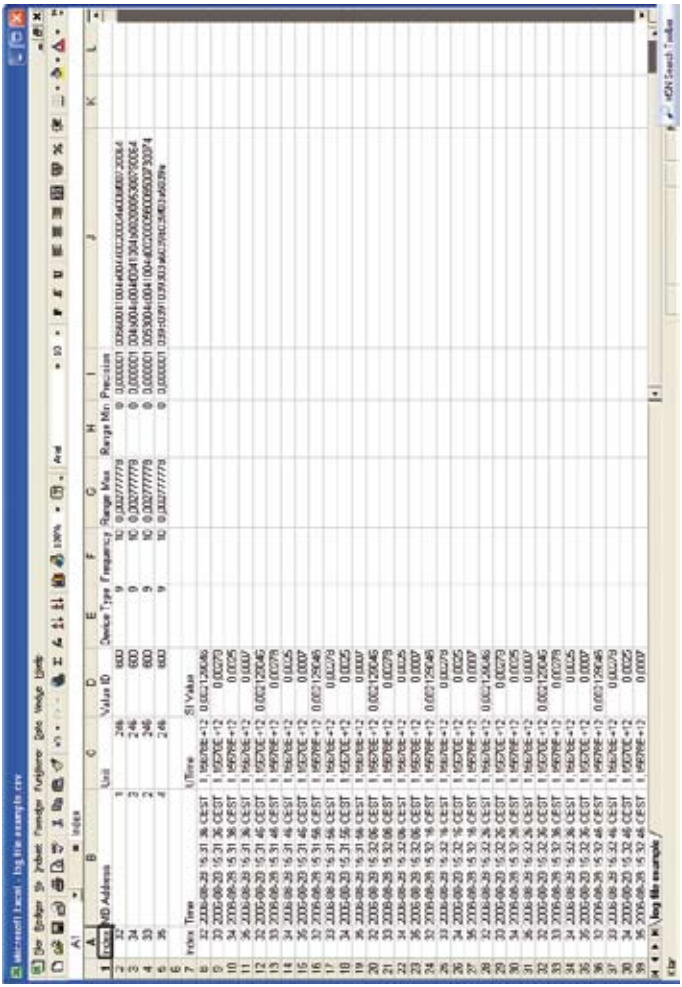
Appendix D. Log Files

The example log file shown below is the result of a CSV file from the converter (see "Save Log Data" procedure on page 91) having been opened in with Microsoft® Excel® spread sheet utility.

The example below illustrates a Oxix® converter being logged every 10 seconds.



The entries are described on the following page.

Index Converter ID (here four converters: 32, 33, 34 and 35)

MB Address Modbus address (here: 1, 2, 3 and 4)

Unit SI unit according to the MJK unit codes (here: 246=NTU)

MJK Unit Codes		
Code no.	**Unit**	
16	GPM	gallons per minute
17	l/min	litres per minute
19	m^3/h	cubic meters per hour
23	MGD	million gallons per day
24	l/sec	litres per second
28	m^3/sec	cubic meters per second
57	%	percent
95	mg/l	milligrams per litre
96	kg/l	kilograms per litre
97	g/l	grams per litre
130	ft^3/h	cubic feet per hour
138	l/h	litres per hour
139	ppm	parts per million
246	NTU	Nephelometric Turbidity Units
248	FNU	Formazin Nephelometric Units
249	EBC	European Brewing Convention
250	FTU	Formazine Turbidity Units

Value ID Modbus address for flow (here: 600)

Device Type The device type (here: 9 = SuSix®)

MJK Device Type Codes	
Code no.	**Unit**
1	Display
2	MagFlux
3	Connect
4	702 Comtroller
5	Shuttle
6	pH-transmitter
7	Redox
8	Pressure transmitter
9	SuSix
10	Field log
11	Oxix

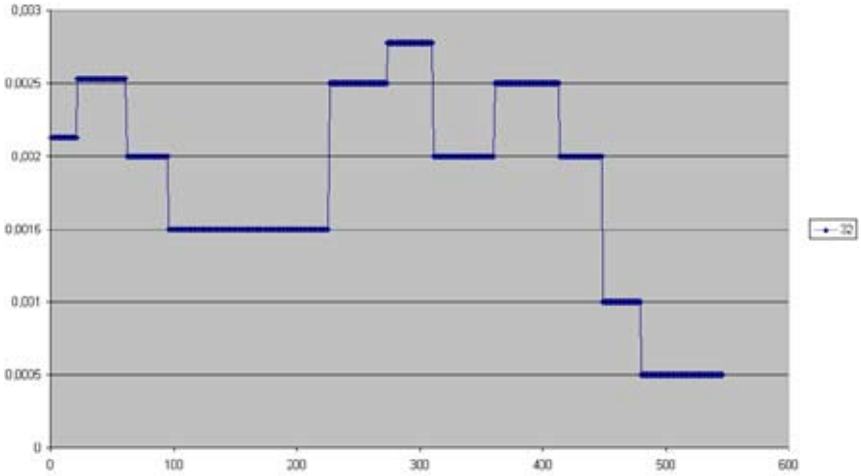
Frequency Log interval in seconds (here: 10 seconds)

Range Max Maximum value for graph

Range Min	Minimum value for graph
Precision	The precision of the SI value
Column J	The sensor name as entered by the operator.
Time	Date and time in Central European Standard Time (CEST)
UTime	The time in UNIX format. Number of seconds since January 1, 1970.
SI Value	The value in SI units (**S**ystème **I**nternational d'Unités)

To plot the log file's data, proceed as follows:

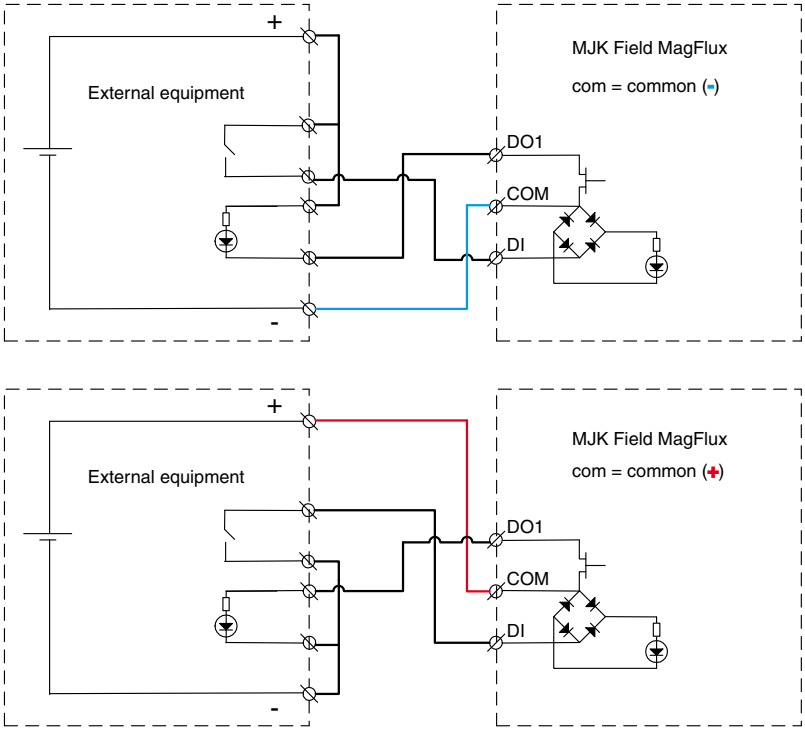
1. Start Excel and open the csv log file.
2. Sort by "Index", click the "Diagram Guide" tool in the toolbar and select the required curve or graph (see example on the next page).



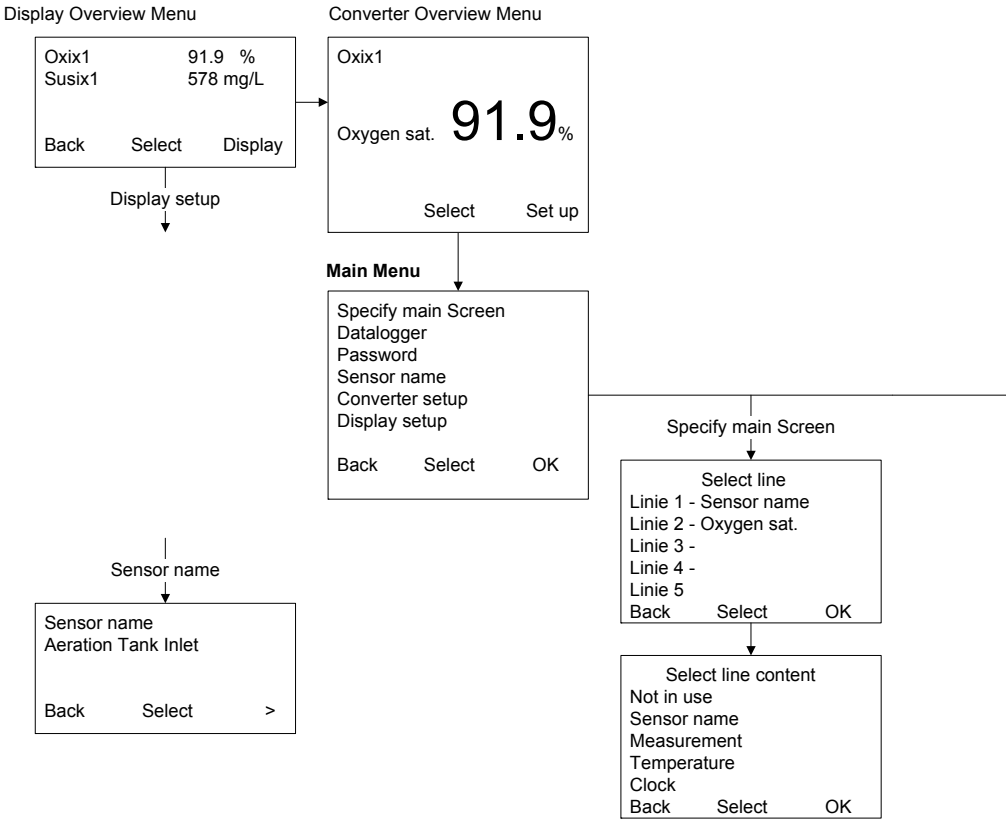
Appendix E. Input/Output Connections

The digital in- and outputs, DI and DO, can be interconnected to external equipment to achieve a number of functions such as alarms, counter reset, flow direction indication, etc.

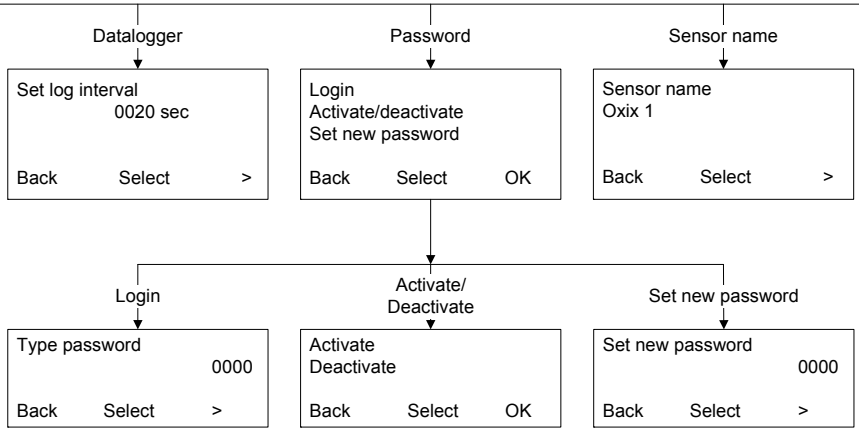
The two schematics below illustrate a simplified mode of operation.



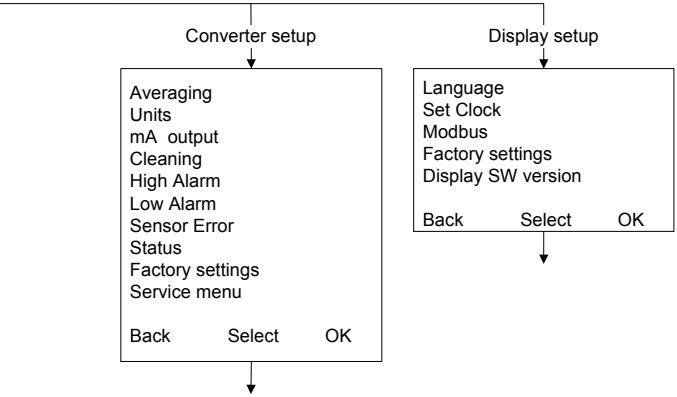
Main Menu Overview



Main Menu Overview (continued 2)



Main Menu Overview (continued 3)



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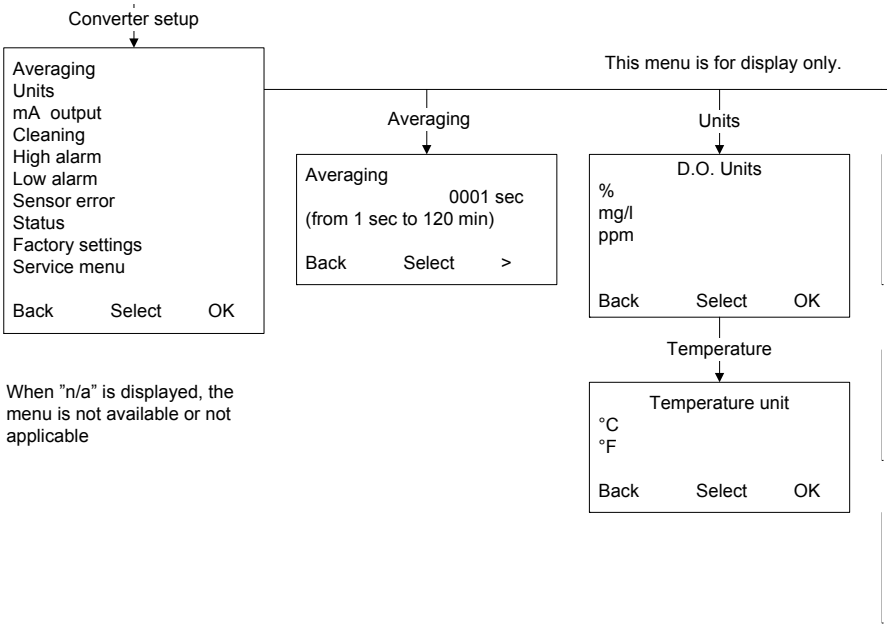
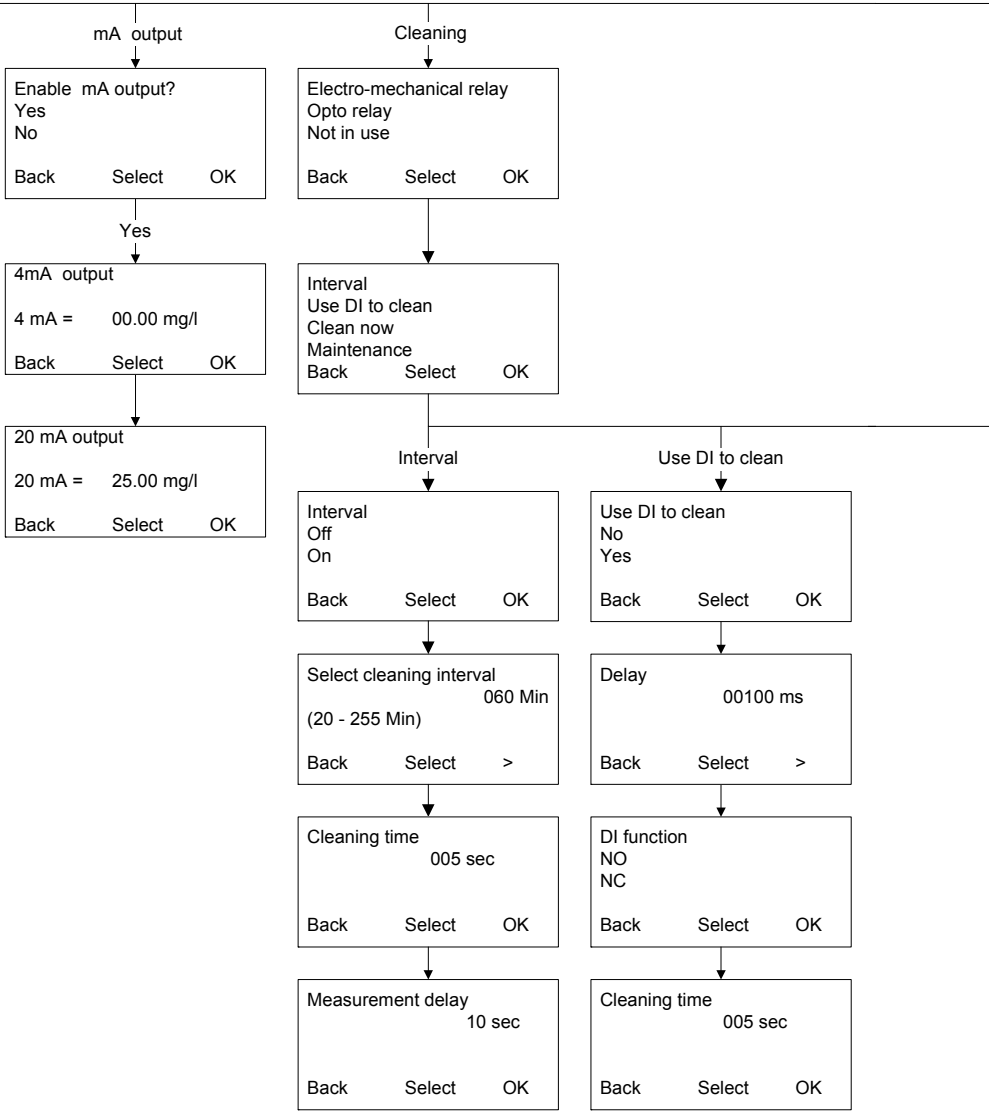
Converter Setup Menu Overview

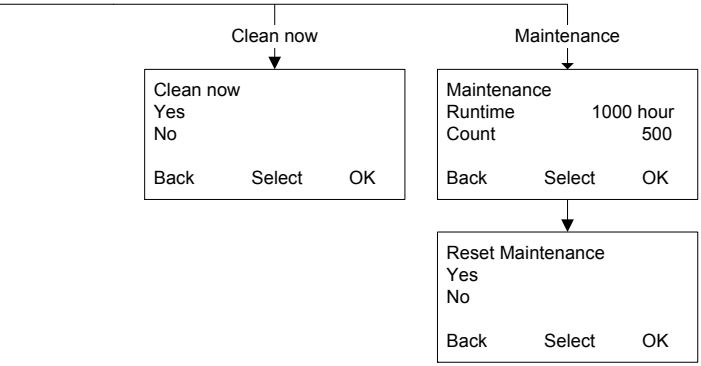


When ”n/a” is displayed, the menu is not available or not applicable

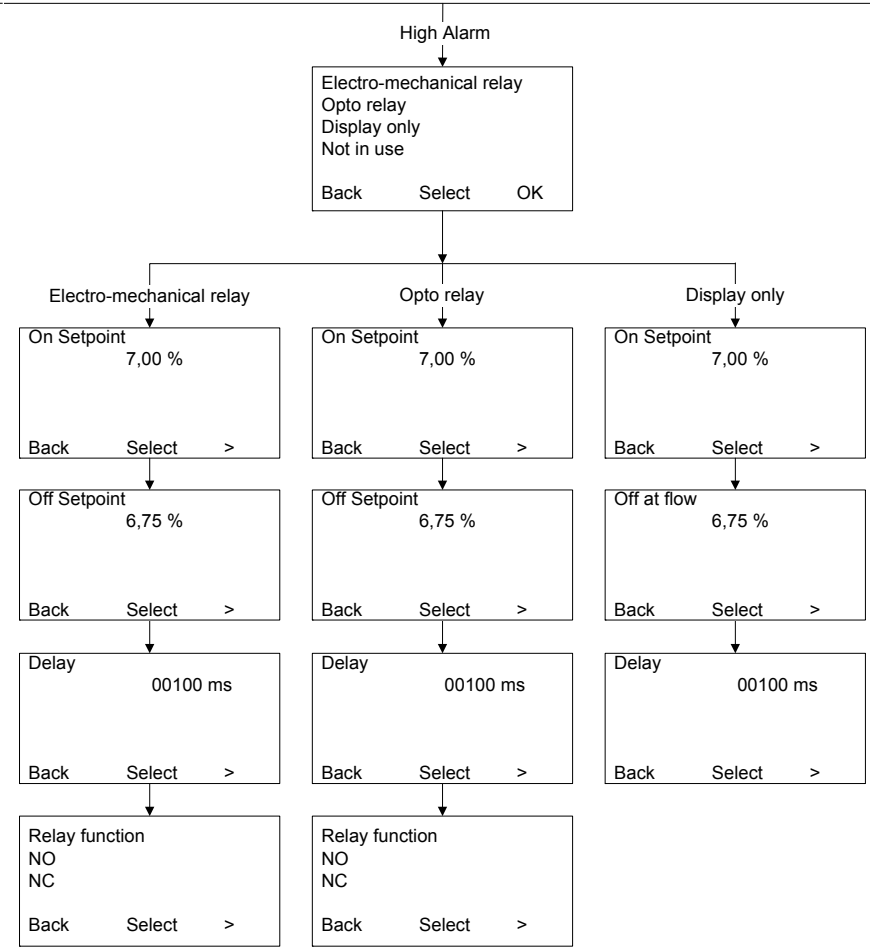
Converter Setup Menu Overview (continued 2)



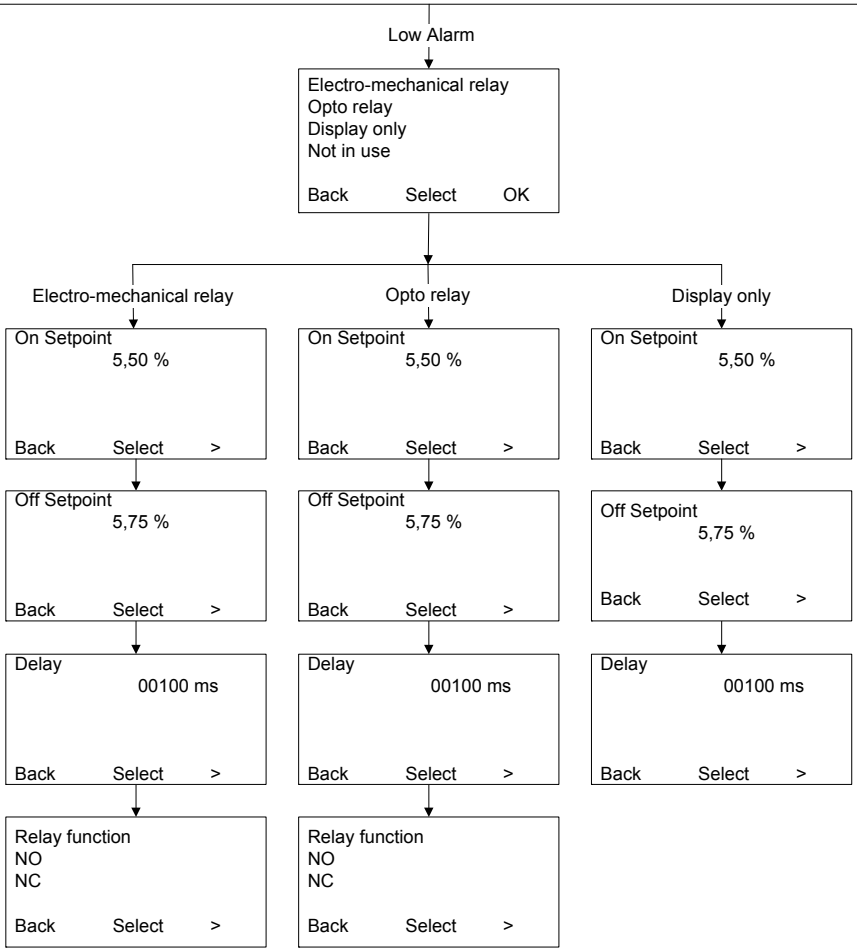
Converter Setup Menu Overview (continued 3)



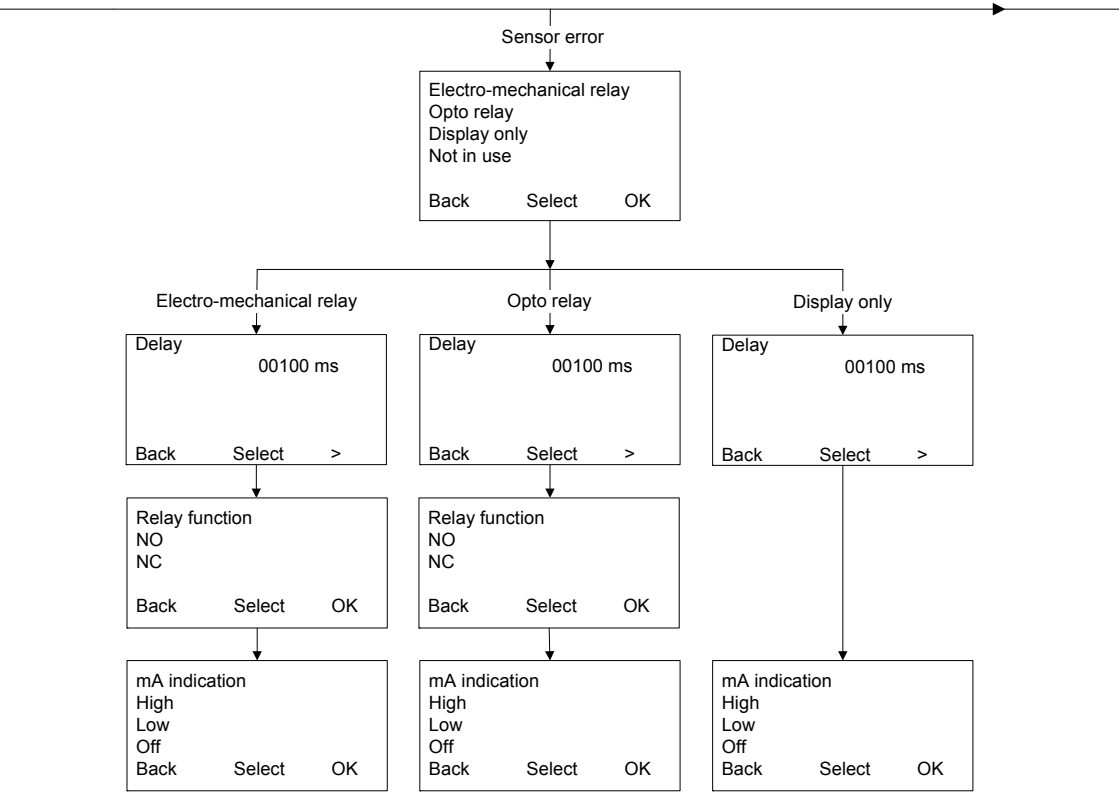
Converter Setup Menu Overview (continued 4)



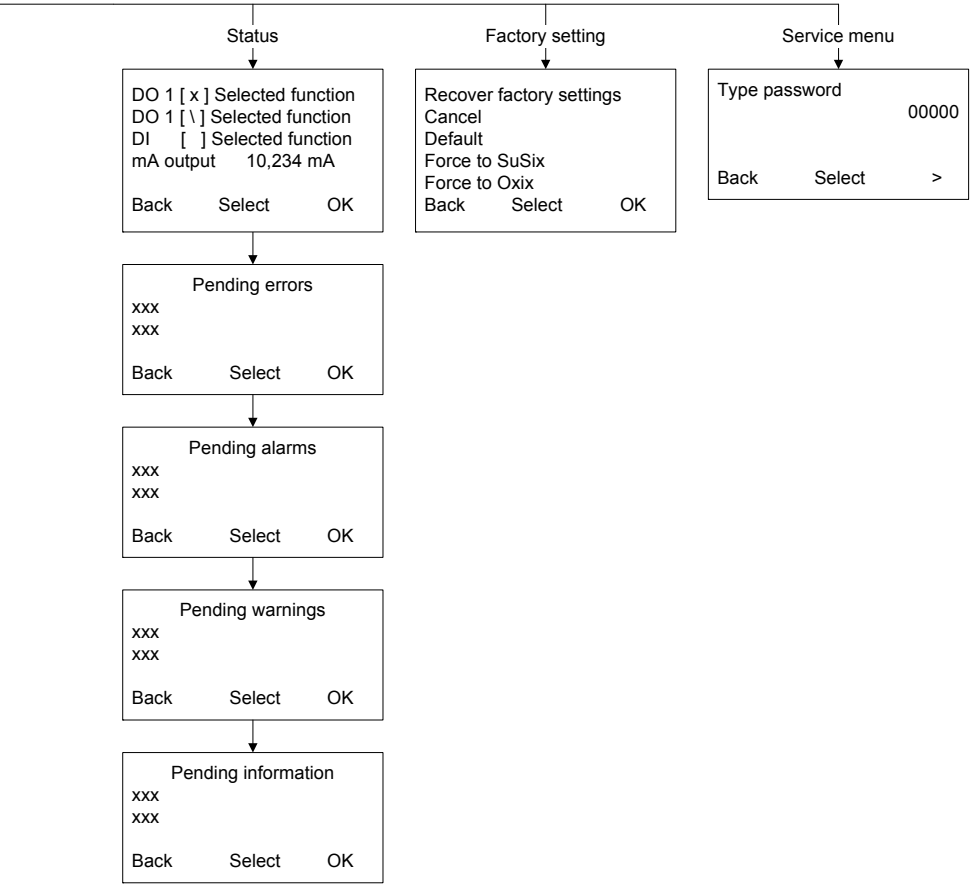
Converter Setup Menu Overview (continued 5)



Converter Setup Menu Overview (continued 6)



Converter Setup Menu Overview (continued 7)



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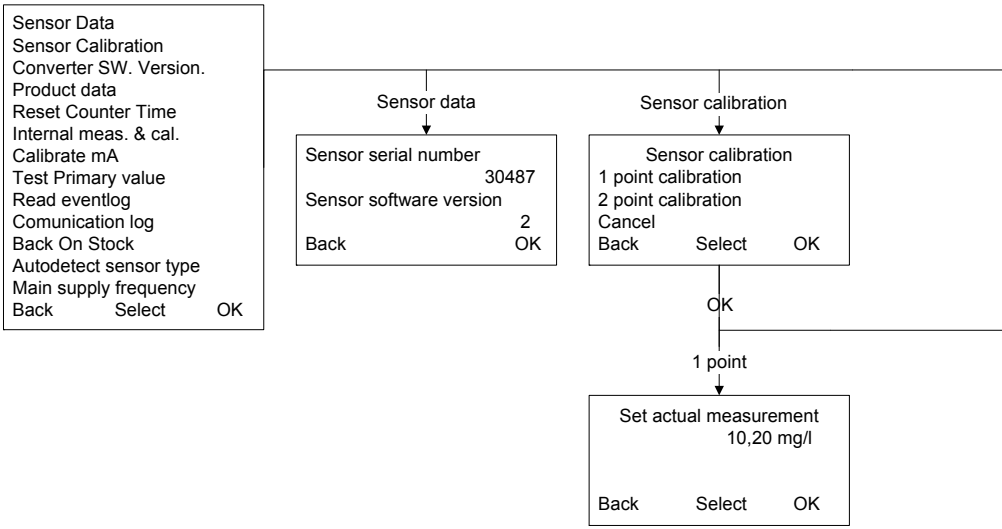
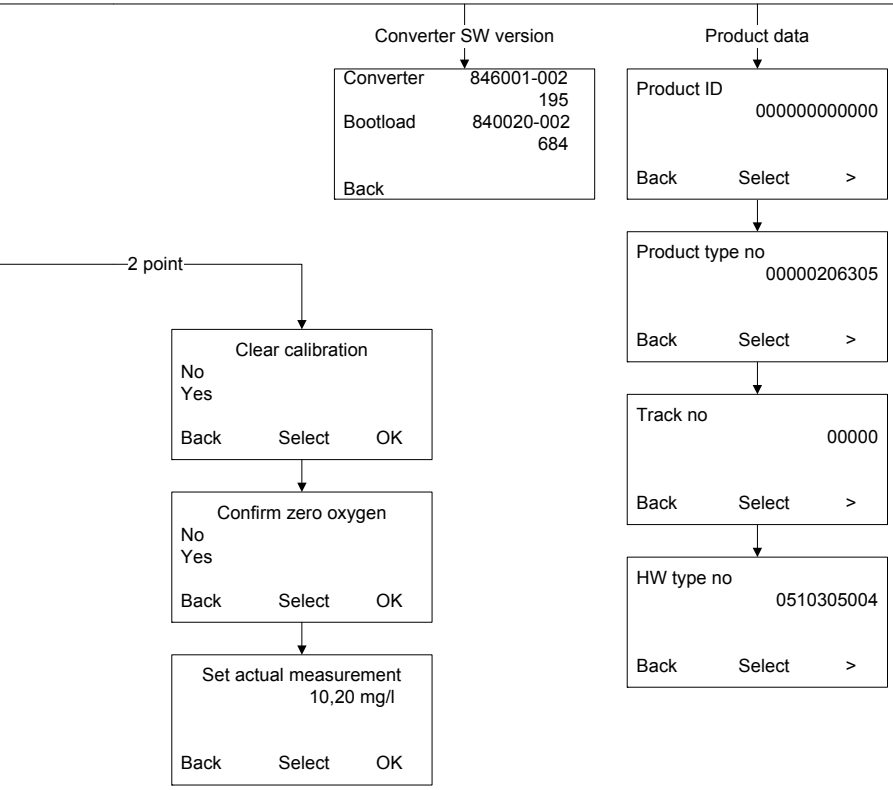
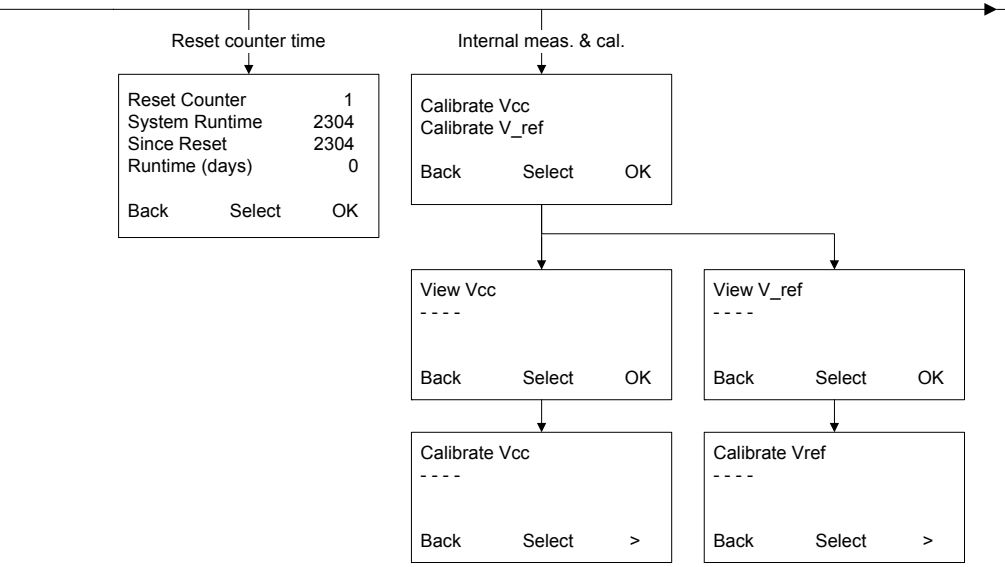
Service Menu Overview



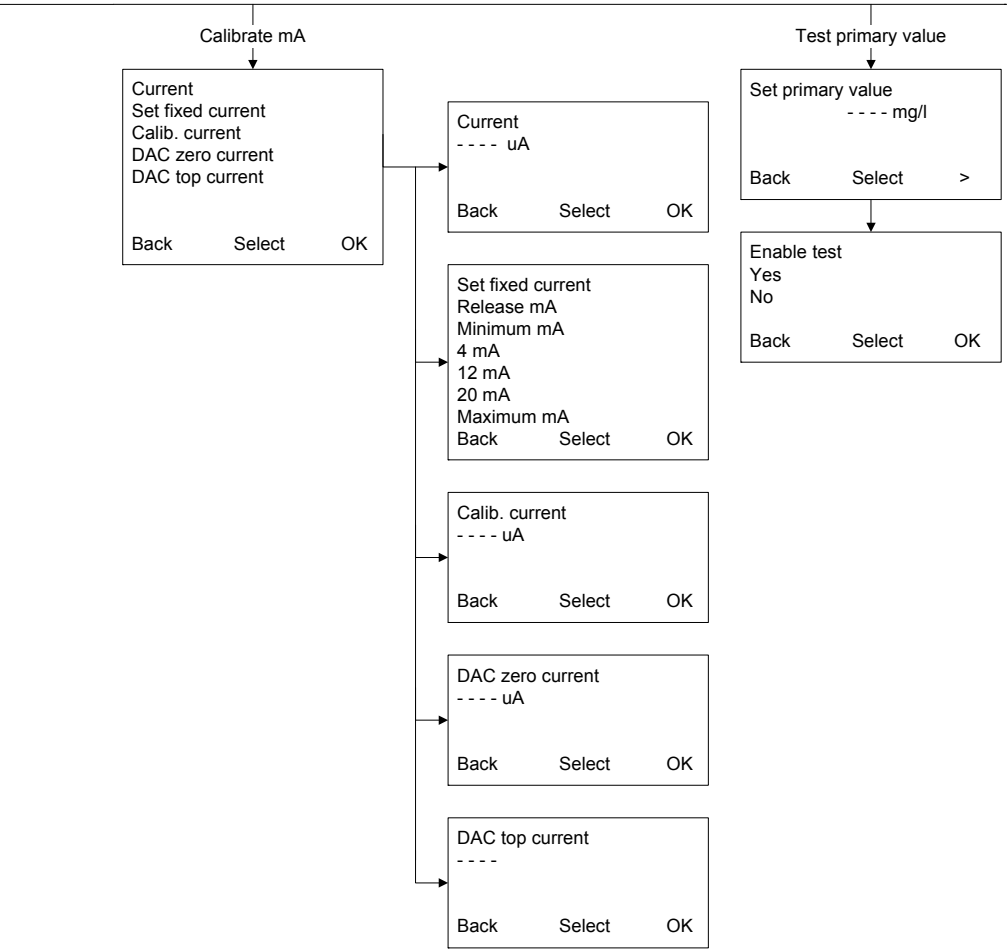
Service Menu Overview (continued 2)



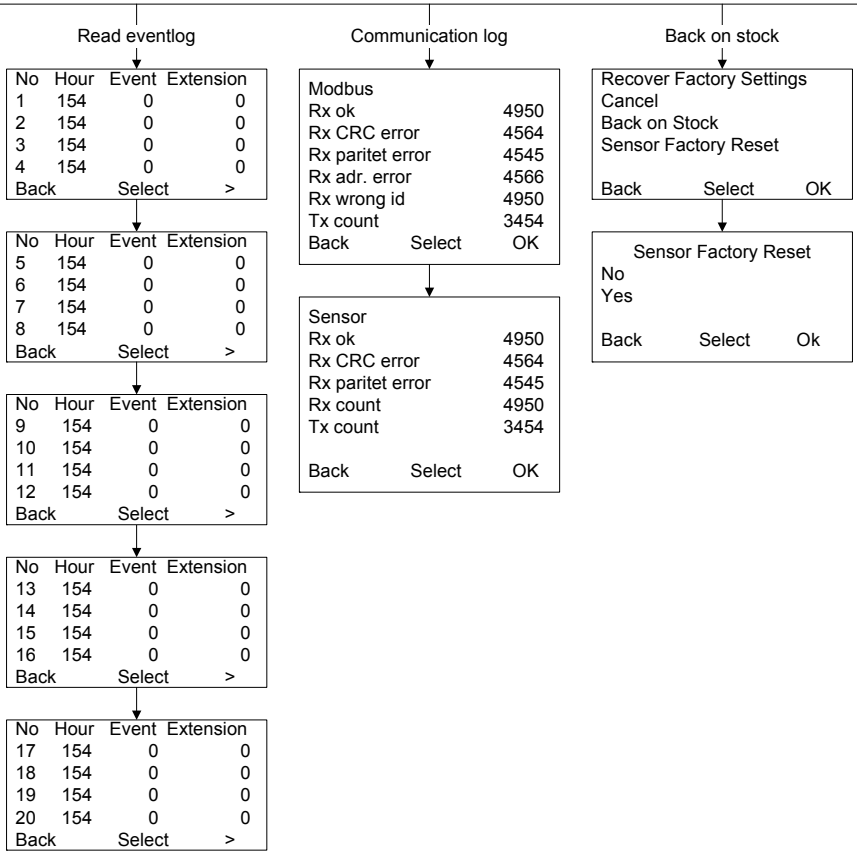
Service Menu Overview (continued 3)



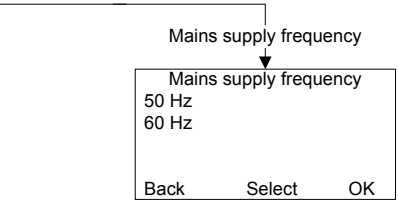
Service Menu Overview (continued 4)



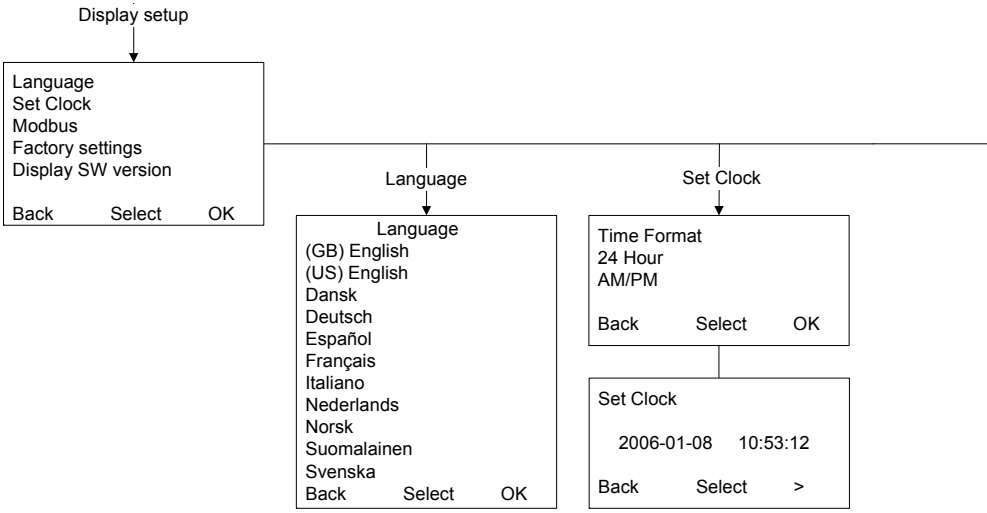
Service Menu Overview (continued 5)



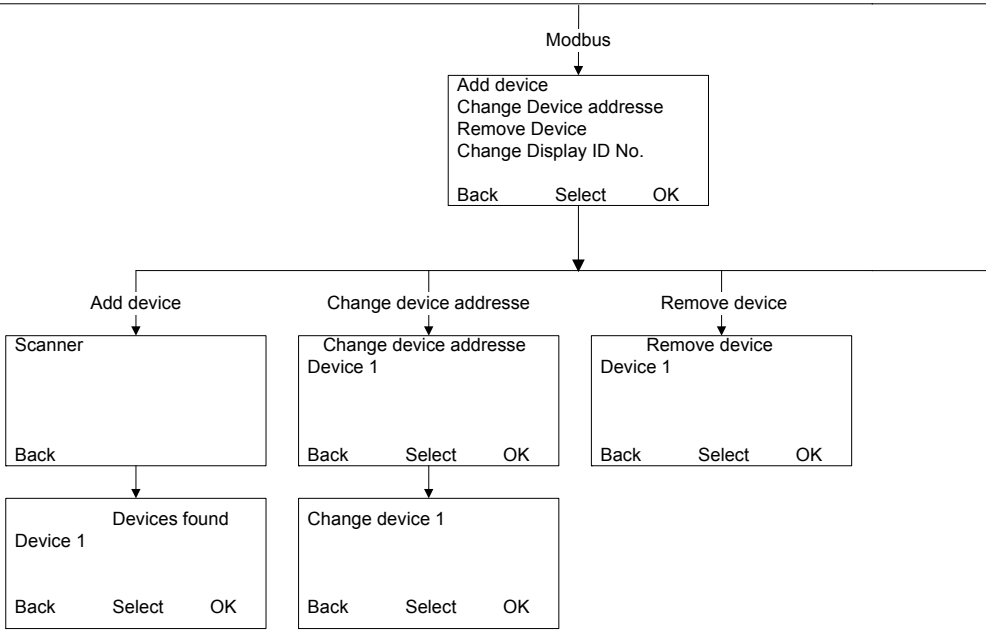
Service Menu Overview (continued 6)



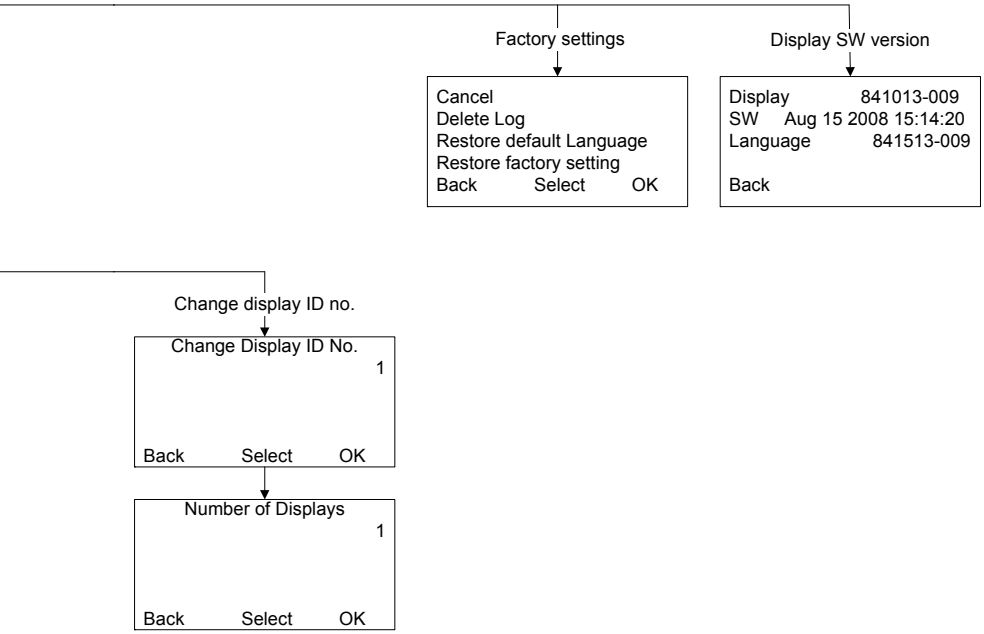
Display Setup Menu Overview



Display Setup Menu Overview (continued 2)



Display Setup Menu Overview (continued 3)



eof

Index

A

accessories 17
accuracy 15
activate/deactivate 48
Add Device 75
aeration 20
alarms 12, 85
analogue output 12, 27
  programming 27
approvals 2

B

Back on Stock 70
battery 15
baud 15

C

cable 16
Calibrate mA 67
calibration 63, 67
  0-point 21
  2-point 21
calibration 21
Change controller ID 76
Change device address 76
Change password 48
cleaning
  display 83
  sensor 83
cleaning 54
clock 15
Clock 43
Communication log 70
configuration
  examples 31
conformity 2
contrast adjustment 40
converter overview menu 41
Converter setup 51
Converter SW Ver. 64

D

data logger 11, 44
device type 98
digital input
  programming 28
digital output 12, 27, 101
  programming 27
dimensions 79
  converter and display unit 80
  immersion fitting 81
  sensor 79
DI selected function 60
display 11, 38
  one connected unit 38
  several connected units 39
Display SW Version 77
DO1 selected function 60
DO2 selected function 60

E

EEC 2
electrical mounting 23
EMC 2
error messages 9, 85
Ex approval 2
explosion hazards 13

F

Factory settings 60, 77
features 11
Field Link 11, 89
firmware 9, 89
fluorescence 10
front panel 95
functional tests 83
fuse ratings 24
fuses 19

G

gel 10
graph 11, 12, 46
grounding 37

H

High alarm 56
hotline 7

I

Important! 19, 30
index 8
injury 13
info 86
initial checks 37
input, digital 28
installation 19, 20
Internal Meas. & Cal 66
introduction 7

J

jumper 25

K

keys, display 39

L

Language 73
language 37, 73, 94
LCD 15
light emission 10
log
  capacity 45
  data 91
  files 97
  interval 45
login 47
Low alarm 57

M

MagFlux 11
maintenance 83
mA Output 53
mechanical dimensions 79
menus
  Converter Setup 51
  Converter Setup Menu Overview 106
  Data Logger 44
  Display setup 72
  Display Setup Menu Overview 120
  Main Menu 41
  Main Menu Overview 102
  Sensor Name 49
  Service Menu 61, 62
  Service Menu Overview 114
  Specify Main Screen 42
Modbus 12, 75
modular 11
MOSFET 15

N

NEMA 15
Not in use 42
NPT 17

O

operating principles 10
options
  Activate/Deactivate 48
  Add Device 75
  Autodetect sensor type 71
  Averaging 52
  Back on Stock 70
  Calibrate mA 67
  Change controller ID 76
  Change device address 76
  Change password 48
  Cleaning 54
  Clock 43
  Communication log 70
  Converter Setup 51
  Converter SW Ver. 64
  Datalogger 44
  DI selected function 60
  Display Setup 72
  Display SW Version 77
  DO1 selected function 60
  DO2 selected function 60
  Factory Settings 77
  Factory settings 60
  High alarm 56
  Internal Meas. & Cal. 66
  Language 73
  Login 47
  Low alarm 57
  Mains supply frequency 71
  mA Output 53
  mA output 60
  Meas. 42
  Measurement 42
  Modbus 75
  Not in use 42
  Password 47
  Product Data 65
  Read Event Log 69
  Remove Device 76
  Reset Counter Time 65
  Sensor calibration 63
  Sensor data 63
  Sensor error 58
  Sensor Name 49
  Service Menu 62
  Set Clock 74
  Specify Main Screen 42
  Status 59
  Temperature 43
  Test primary value 68
  Units 52
order numbers 17
outputs 27, 101
overviews 41
Oxix 11

P

part number 13
password 47
physical mounting 13
pop-up alarm 12
pop-up events 85
power consumption 15
power supply 15, 16, 24
ppm 16
pressure 16
Product Data 65
programming
  input and outputs 27

Q

quality 7
quenching 10

R

Read Eventlog 69
Remove Device 76
repair 13
reset, system 40
Reset Counter Time 65
response time 16
RG 17
RS-485 15
RTU 12
ruthenium 10

S

safety 13
SCADA 12
Sensor
  data 63
  error 58
  Name 49
service 83
Service Menu
  detailed 62
  digest 61
Set Clock 74
software 9, 89
specifications 15
Status 59
SuSix 11
system configuration 31

T

temperature range 15
terminals
  converter 29
  sensor 30
Test primary value 68
theory 10
trademark 7
twisted wire 11

U

units 52, 98
update 11
upgrade 9, 91, 93
USB 11, 15, 45, 87

V

voltage
  10 - 30 volt DC 24
  24 volt AC 24
  115 volt AC 25
  230 volt AC 25

W

WARNINGs 13, 19, 23, 86
wavelength 10
web sites 7
weight 15, 16, 19
wiring schematics 33, 35

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